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# Manitoba's Threatened and Endangered Grassland Birds

## 1991 Update and Five-Year Summary

De Smet, K. D. 1992

**Manitoba**
**Natural Resources**
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Prepared by:

_____

Approved by:

_____
Supervisor

_____
Section Chief/Director

Manitoba's threatened and endangered grassland birds:
1991 update and five-year summary.

De Smet, Ken D. 1992.

Manitoba Department of Natural Resources
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## ABSTRACT

Surveys in southern Manitoba during 1991 revealed declines in Ferruginous Hawk (Buteo regalis), Burrowing Owl (Athene cunicularia), Loggerhead Shrike (Lanius ludovicianus) and Baird's Sparrow (Ammodramus bairdii) nesting populations. Forty-eight nesting Ferruginous Hawk pairs were found; 60% were successful. Nesting success and the number of young fledged/initiated nest were slightly higher than 1987-1991 averages. Seventy-six Ferruginous Hawk juveniles were banded. Twenty-three Burrowing Owl nesting pairs were found; 61% were successful, much lower than the 75% five-year average. Productivity was 6.3 young/brood or 3.8/initiated nest; 81 juveniles and 8 adults were banded. Of 161 Loggerhead Shrike nests found, 103 were monitored from the egg stage to fledging. These produced smaller broods (5.1 young) but more young/nest (3.7) than five-year averages. Thirty-seven adult shrikes and 610 juveniles were banded. Thirty-seven Baird's Sparrow nests were found; 14 were successful. Eight adult Baird's and 53 juveniles were banded.

Low return rates for banded Burrowing Owl adults (32%) and juveniles (5%) suggest that high mortality on the nesting, migration and wintering areas may be contributing to recent population declines. The percentage of adult Loggerhead Shrikes that were banded as juveniles in Manitoba was also low (4%). One in 40 (3%) of the Ferruginous Hawk adults that were checked had been banded as a juvenile. Fifty juvenile Burrowing Owls from North Dakota were released in southwestern Manitoba. At least one juvenile from the 1990 release returned and nested. Another Burrowing Owl pair successfully nested in an artificial nest burrow. Both were firsts for Manitoba. Twelve artificial nest structures were used by Ferruginous Hawks, representing one-quarter of the 1991 nesting population. Other conservation activities are discussed, including various public education and landowner awareness strategies, identification and leasing of critical grasslands, and involving other individuals and agencies in recovery efforts.

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Sight records were contributed by:

Jackie Ansell (The Pas)
Dave Barnes (Brandon)
Romeo Barre (Bellview)
Charlie Bartley (McCauley)
Vern Bauman (Swan River)
Randy Bean (Winnipeg)
Ken Belcher (Winnipeg)
Robert Berger (Winnipeg)
Larry Bidlake (Brandon)
Cindy Blicq (Winnipeg)
David Braddell (Reston)
Rick Branston (Albert\Tilston)
Ron Brisly (Brenda RM\Waskada)
Dwayne Brown (Souris)
Jack Burrows (Hartney)
S.Caumartin (Glenwood\Souris)
Dan Chranowski (Brandon)
Brad Coe (Cameron RM\Hartney)
Mike Conrad (Winnipeg)
Jim Cooper (Brandon)
Joan Cooper (Arthur RM\Melita)
Cal Cuthbert (Minnedosa)
Lorraine Demman (Portage)
Claire & Marj Denning (Souris)
Chuck Dixon (Boissevain)
Lynn Dooley (Winnipeg)
Dave Dyck (Boissevain)
Jake Enns (Altona)
Pat Ewasko (Brandon)
Cliff Findley (Shoal Lake)
Rodney Gardham (Crandall)
Jim Gervin (Broomhill)
Gord Graham (Winnipeg)
Jerry&Cindy Greenley (Lyleton)
Gord Grieef (Winnipeg)
Glen Grierson (Broomhill)
Keith Grieves (Medora)
Zach Gross (Beresford)
Al Hamilton (Winnipeg)
David Hatch (Winnipeg)
Christopher Higgs (Winnipeg)
Sherry Hohn (Winnipeg)
George Holland (Winnipeg)
Jean Horton (Brandon)
W. Howden (Goodlands)
Scott & Bill Hunt (Hartney)
Linda Iwaszenski (Winnipeg)
Bob Jones (Portage)

Kris Kaasgard (Pipestone)
Paul Klassen (Beresford)
Rudolf Koes (Winnipeg)
John Larson (Portage)
Betty Lavender (Winnipeg)
Roland Lebreau (Pipestone)
Wendy Manchur (Wpg)
Doug McDonald (Minto)
Jeff McKinney (Waskada)
Ted Meaud (Margaret)
Cory Meadows (Brandon)
Tim McMechan (Lyleton)
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Eric Moir (Treesbank)
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Robert Rogers (Westbourne)
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Norm Short (Rivers)
Martin Siepman (Winnipeg)
Dan Soprovich (Swan River)
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Arnold Swanson (Melita)
Peter Taylor (Pinawa)
Russ Tkachuk (Winnipeg)
Cliff Trinder (Russel)
Rob Trott (Edward RM\Pierson)
Mr. & Mrs. Leo Vodon (Virden)
Ken Voth (Medora)
Mitch Walker (Boissevain)
Bill Walley (Dauphin)
Ralph & Mary Wang (Pierson)
Harold Watson (Brandon)
D. Wickham (Waskada).

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## 1.0 INTRODUCTION

Several grassland birds that are threatened nationally and endangered in Manitoba have provincial distributions that roughly parallel the extent of grasslands in southwestern Manitoba. These include the Ferruginous Hawk (Buteo regalis), Burrowing Owl (Athene cunicularia), Loggerhead Shrike (Lanius ludovicianus) and Baird's Sparrow (Ammodramus bairdii). These four species and the grassland habitat they occur in have been the focus of conservation efforts in southwestern Manitoba since 1987.

Declines in the breeding range and populations of the Ferruginous Hawk in prairie Canada are well-documented (Schmutz and Schmutz 1980, Houston and Bechard 1984, Schmutz 1984). These declines have been attributed to early persecution and egg-collecting, habitat loss due to cultivation and fragmentation of native grasslands, and loss of prairies to aspen regeneration following the curtailment of prairie fires. Although information on historical numbers and distribution in Manitoba are limited, the Ferruginous Hawk was once considered regular but uncommon in southwestern and south-central Manitoba from the Red River west (Thompson 1891, Taverner 1937, Bechard 1981). Criddle (1920, 1929) considered it a common nesting species in the Aweme area (near Spruce Woods Park), but it was already "less common than in 1890" due to settlement and the spread of agriculture. Houston and Bechard (1984) believed that egg-collectors had a significant impact on populations, noting that over 20 egg sets were collected near Gainsborough, in extreme southeastern Saskatchewan, from 1925 to 1930. After 1930, the species went unnoticed in Manitoba until they were reported in the southwest during the 1970's (Knapton 1979) and 1-3 nests were found from 1982 to 1985 (Ratcliff and Murray 1984, Ratcliff 1987a). Since 1987, surveys have been intensified to where 56 nesting pairs were found during 1990 (De Smet and Conrad 1989a, 1990; De Smet 1991). Given that the present distribution of Ferruginous Hawks in Manitoba is limited and only relict fragments of its former habitat exists, current numbers probably represent only a fraction of historic abundance.

The population of Burrowing Owls nesting in Canada has been in decline since the mid-1900's with the onset of modern agricultural practices. Habitat loss, pesticide use, vehicular collisions and burrowing mammal controls have all contributed to these declines (RENEW 1990). Although data on historic numbers in

Manitoba are limited, populations appear to have undergone continuous declines since the 1930's (Ratcliff 1986). Wedgwood (1978) estimated that 110 pairs nested in the province. At that time the species occurred as far east as Winnipeg and north to Riding Mountain National Park. Ratcliff (1986) documented a decline from 76 nesting pairs in 1982, to 35 pairs in 1984. At the same time, peripheral populations were virtually eliminated and the range was reduced to southwestern Manitoba. Since 1987, surveys have been refined and expanded, yet known nesting populations continue to decline (Haug and Churchward 1988, De Smet and Conrad 1990, De Smet 1991).

Although the Loggerhead Shrike occurs throughout much of North America, Breeding Bird Survey and Christmas Bird Count data have demonstrated declines throughout its breeding and wintering range. Butcher and Lowe (1990) state "Rarely does a species with this large a range show such a consistent widespread decline". Loggerhead Shrikes were considered common to abundant throughout southern Manitoba during the late 1800's and early 1900's (Thompson 1892, Macoun and Macoun 1909). Since then, the northern edge of their range has retracted and numbers have experienced pronounced declines (Cadman 1985). Extensive surveys since 1987 have revealed that the extreme southwest remains the last stronghold for the species in the province; of approximately 250 pairs found in the province annually, 85-90% occur in the extreme southwest (De Smet and Conrad 1987, 1989b, 1990; De Smet 1991). Even here, overall numbers have declined during the past five years, led by a decline in peripheral populations. Since productivity appears adequate, a combination of limiting factors including habitat loss, increased predation, vehicular collisions, contaminants, post-fledging losses and problems on the wintering range probably account for the continuing decline.

The Baird's Sparrow is an uncommon resident of grasslands in the Northern Great Plains. Although it occasionally occurs in altered grasslands and cropland, its habitat preferences are generally considered to be restricted and unadaptable. Consequently, the species has suffered population declines proportional to the demise of native prairie in the Great Plains. In the late 1800's, the Baird's was referred to as "one of the commonest birds....of the prairies westward of Pembina Mountain to Moose River" (Thompson 1892). A major study on the species was conducted in Winnipeg during the 1930's (Cartwright et al. 1937). The species is now considered extirpated in northern portions of its Manitoba range, sightings in the Winnipeg area and in southeastern Manitoba are scarce (Cleveland et al. 1980), and its distribution in southwestern Manitoba is considered "spotty" (Lane 1968).

In 1989, the Baird's was classified as threatened in Canada based on ongoing declines and range reductions throughout its breeding and wintering range (De Smet and Miller 1989). Surveys in southwestern Manitoba have been ongoing since 1985 (Ratcliff 1987b, De Smet and Conrad 1989c, De Smet 1991).

These four species all share a common problem, namely habitat (grassland) losses. Other species which have been monitored on an incidental basis in the southwest since 1987 and for which concerns also focus around disappearance of their grassland habitat include Marbled Godwits (Limosa fedoa), Willets (Catoptrophorus semipalmatus), Upland Sandpipers (Bartramia longicauda), Say's Phoebes (Sayornis saya), Willow Flycatchers (Empidonax trailii), Sprague's Pipits (Anthus spragueii), Lark Buntings (Calamospiza melanocorys), Grasshopper Sparrows (Ammodramus savannarum) and Chestnut-collared Longspurs (Calcarius ornatus)). This report discusses monitoring and management of rare, threatened and endangered grassland birds and their habitat in southwestern Manitoba during 1991 and summarizes 1987-1991 efforts.

## 2.0 METHODS

### 2.1 Ferruginous Hawk

Field work was conducted from 16 April to 16 August, 1991. The nesting distribution of Ferruginous Hawks was primarily assessed during April. Extensive grassland areas were visited, especially those where Ferruginous Hawks nested or have been seen in previous years (partial list presented in Section 3.1.1). These grasslands and surrounding terrain were scanned with binoculars for hawks and potential nests. Nest occupants were identified from a distance (at least 0.5 km) with a window-mounted 15-60X spotting scope to avoid early disturbance that might cause nest desertion. If a nest appeared built up but no occupants were obvious, it was revisited at a later date to determine if it was being used. Although visits to suitable areas and potential nests were continued throughout the summer, 87% of the eventual Ferruginous nests were found before 2 May and only one nest was located after 28 May. Juvenile Ferruginous Hawks were banded between 26 June and 8 July. Measurements were made on all juveniles, including primary quill length, foot pad and tarsus length. Additional artificial nest structures were erected between 24 July and 15 August.

2.2 Burrowing Owl

Surveys for nesting Burrowing Owls commenced on 1 May and continued throughout May and early June. These surveys involved visits to historic sites, discussions with local landowners, following-up public reports, and scanning all suitable-looking pastures, haylands and idle grasslands -- especially those with short or sparse vegetation and readily apparent Richardson's ground squirrel (Citellus richardsoni) populations or numerous burrows. Taped Burrowing Owl calls were employed to entice territorial adults to respond (the call normally draws one or both adult owls out of their burrow and elicits a threat and calling display by the male; while displaying the birds are seen or heard much more readily than if they are stationary or part way down the burrow). Calls were played on a portable cassette player and broadcast over a loudspeaker mounted on the outside of the vehicle. Scans were conducted from within the vehicle since adults tended to remain hidden if observers were obvious.

Most of the eventual nesting Burrowing Owl pairs had been located by the end of May; only two pairs were found after 5 June. A window-mounted spotting scope and taped call were used in determining if adults were banded. Band numbers on aluminum or plastic bands were often read with the spotting scope. Other adults were caught in Potter's traps baited with live mice or in a one-way cage at the burrow entrance. Juveniles were caught and banded between 4 and 26 July in a one-way cage at the main burrow or at nearby satellite burrows. Juvenile wing chords were measured to the nearest millimetre; wing chords, foot pad and tarsus length were measured on all adults handled.

A cooperative program was initiated with the North Dakota Game and Fish Department in the summer of 1991. Preliminary data on Burrowing Owl populations in southwestern North Dakota was provided in return for juvenile owls for reintroduction in southwestern Manitoba. Surveys were conducted in prairie dog (Cynomys ludovicianus) colonies situated on U.S. Forest Service lands in the Little Missouri National Grasslands between 1 and 10 May. Prairie dog towns were accessed on foot or by vehicle. Higher vantage points were selected nearby or within the colony and the area was thoroughly scanned with binoculars and a spotting scope before and after a taped Burrowing Owl call was played. Seven release pens, complete with artificial nesting burrows, were set up on a slight rise in a sparsely vegetated native hayland near Broomhill, Manitoba (C15-5-27) in July. Partial

families were trapped (one-way cages) or dug out of burrows from four widely dispersed sites in southwestern North Dakota between 15 and 19 July. The owls were transported in perforated cardboard boxes by vehicle back to Manitoba, placed in the release pens and fed chopped up mice and small rats twice a day. On 1 August, the pens were removed. The young continued to be fed at the release site and were observed daily until mid-August.

## 2.3 Loggerhead Shrike

Loggerhead Shrikes were noted in southwestern Manitoba as early as 17 April. Most did not arrive until late April and searches for nesting pairs did not commence until early May. After mid-May, nest searches were intensified in areas where behavioral observations suggested that pairs had initiated egg-laying. A 5-10 minute observation was conducted when birds or pairs were initially seen; during this time, behavioral and habitat particulars were noted on prepared data sheets. Some nests were found by watching the mate fly back to the nest vicinity with a food item. Other nests were located by searching in trees and shrubs close to where pairs had nested in previous years, or by conducting nest searches in suspected nesting habitat. Considerable time was spent in the shelterbelt-dominated townships where nests and pairs were often hard to find.

Over 90% of the shrike nests were found during May and June, but new nests with eggs were found until mid-July. Adult shrikes were checked for bands at every opportunity, especially during nest checks. Squeaking noises were often employed to draw in nesting adults during band checks. Some of the band numbers were read in this fashion without having to recapture the adult. Other adult shrikes were captured with a baited Potter's trap or mist nets; these were caught during late brood-rearing (12-26 June) to avoid nest desertion. When nests with young were checked, ages of the young were estimated. This allowed us to return and band the juveniles at 10-11 days of age (juveniles that are <7 days old are insufficiently developed; those >14 days old may fledge prematurely after banding operations). Banding of juvenile shrikes took place between 13 June and 2 August. During banding operations, each immature was weighed to the nearest gram with a hand-held Pesola scale.

Special survey routes were created to monitor long-term population trends in two major shrike concentration areas in the southwest (the Poverty Plains and the

Lyleton shelterbelts). Routes were approximately 160 km (100 miles) long and were conducted in a similar fashion to 1987 shrike surveys (Telfer et al. 1989). Survey speeds ranged between 30-40 km/hr; mid-afternoon surveys and temperatures above 25° were avoided.

2.4 Baird's Sparrow and ground-nesting passerines

Baird's Sparrows and other rare ground-nesting passerines were found by making stops and listening in suitable habitat or were recorded while conducting surveys for Ferruginous Hawks, Burrowing Owls and Loggerhead Shrikes. Two survey plots were designed to assess Baird's Sparrow breeding densities, nesting parameters and temporal singing patterns (Davis in prep.). These 800m x 400m plots were situated in an idle hayland (NE22-5-27) and in a pasture (SE29-6-26); both sites had more than 20 territorial Baird's Sparrow pairs in 1990 (De Smet 1991). The plots were flagged at 50 m intervals in May and the nesting densities of Baird's Sparrows were assessed on seven spot-mapping surveys in each plot between 6 June and 7 August.

Nest drags were conducted on these plots and at two other native hayland sites (N25-1-29 and N27-1-29) between 6 June and 1 August. An estimated 100-150 hours were spent conducting drags. Nest drags consisted of a 30 m rope manually dragged by two people; aluminum cans were attached to the rope at approximately 0.5 m intervals to assist in flushing incubating females. Nest searches were conducted when adults were flushed by the drag rope. Nests of Baird's, Grasshopper, and Savannah (Passerculus sandwichensis) sparrows, Chestnut-collared Longspurs, Sprague's Pipits and Western Meadowlarks (Sturnella neglecta) were flagged and monitored at 2-day intervals until hatching and at 3-day intervals thereafter until young were 6 days old (near fledging age). Juvenile Baird's Sparrows in monitored nests were banded at this age. We also banded Baird's fledglings that were flushed during nest drags and were incapable of sustained flight. Several female Baird's Sparrows were caught and banded at nests with a mist-net.

## 3.0 RESULTS AND DISCUSSION

### 3.1 Key Survey Areas

The amount of time spent in each township from mid-April to mid-June was recorded to reflect survey efforts in southern Manitoba (Appendix I). The extent of these surveys are revealed in Figure 1. As in 1990 (De Smet 1991), survey efforts were concentrated in the extreme southwest; 30 of 40 townships south and west of Oak-Plum Lakes were surveyed in excess of 240 minutes (four hours). Areas that were extensively searched included:

a) a strip of grassland-dominated townships from the extreme southwest corner to Oak-Plum Lakes that are ideal for all four study species (townships 1-29, 2-29,
3-28, 4-28, 5-28, 5-27, 5-26, 6-26, 7-25 and 8-25);

b) many of the best areas for Burrowing Owls and Ferruginous Hawks (township 5-22 in the Chain Lakes area; 4-24, 5-24 and 4-25 in the Medora-Lauder-Napinka triangle; 1-26 to 3-26 and 1-27 to 3-27 in the Souris River valley south of Melita);

c) townships with high densities of Loggerhead Shrikes (1-28, 2-28, and 3-29 to 5-29); and

d) other townships in the extreme southwest that are suitable for one or more of these species (including 4-26, 4-27, 6-27, 7-27, 6-28 and 6-29).

#### 3.1.1) Key townships for Ferruginous Hawks

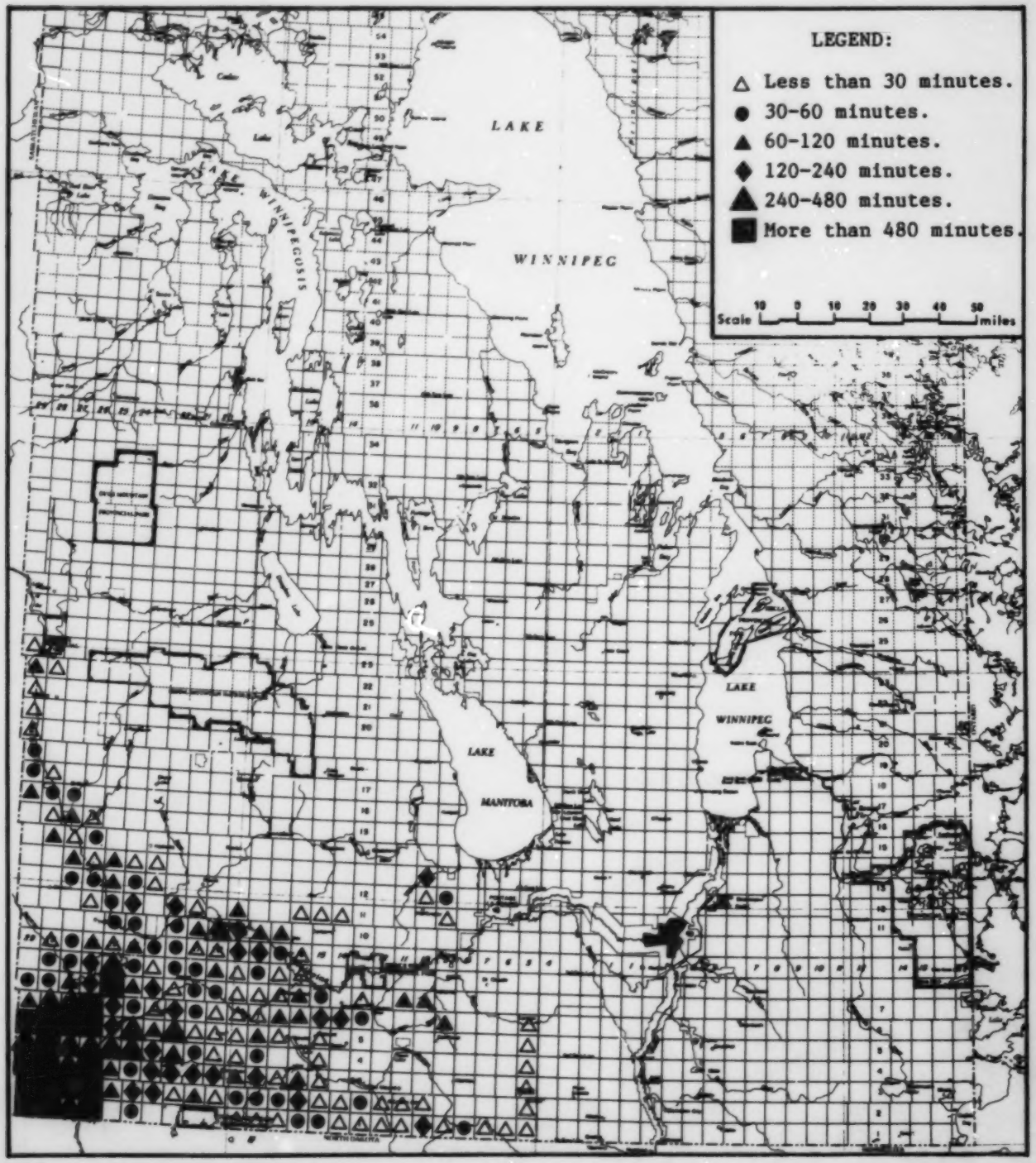
Areas with extensive, open grasslands suitable for Ferruginous Hawks were reflected by townships surveyed for at least 30 minutes during April (Appendix I). Four of these areas are in the Brandon 1:250,000 mapsheet (#62G), five are north of Hwy # 1 (primarily in the Riding Mountain mapsheet, #62K) and 11 are in the southwest (in the Virden mapsheet, #62F).

**Key areas for Ferruginous Hawks in the Brandon mapsheet include:**

1) Townships 6-14, 6-15, 6-16, 7-16 & 6-17 in the Glenboro-Hilton-Treesbank area;

2) 2-16 between Holmfield and Killarney;

Figure 1. Survey effort in southern Manitoba during the 1991 field season based on total time (minutes) spent in each township from mid-April through mid-June, and time spent in infrequently visited townships after mid-June.



3) 9-17, 10-17, 9-18, 10-18, and 9-19 to 11-19 near Brandon; and
4) 3-18 & 3-19 between Ninga and Boissevain.

**Key areas north of Hwy # 1 include:**

1) Townships 10-22 & 11-22 (north of Griswold);
2) 10-24 to 12-24, 10-25 to 13-25, 14-26, 15-27 & 16-27 (grassland ridges east of the Assiniboine River from Oak Lake to Birtle);
3) 12-26, 12-27, 13-27 & 14-28 (grasslands west of the Assiniboine River from Virden to McAuley);
4) 16-28, 16-29, 17-29 & 18-29 (the Ellice and Archie Community Pastures by St. Lazare); and
5) 22-29 (along the Assiniboine River south of Shellmouth).

**Key areas for Ferruginous Hawks in the southwest include:**

1) 3-20, 3-21 & 3-22 in the Boissevain-Whitewater Lake area;
2) 7-20 & 6-21 (northeast of Elgin);
3) 5-22, 4-23 & 5-23 (the Chain Lakes southeast of Elgin);
4) 4-24, 5-24 & 4-25 in the Medora-Lauder-Napinka triangle;
5) 7-23, 7-24 & 8-24 south and east of Oak-Plum Lakes;
6) 7-25, 8-25 & 7-26 between Pipestone and Oak-Plum Lakes;
7) 8-26 & 9-26 (scattered grasslands south of Virden);
8) 4-26, 5-26, 6-26, 4-27 & 5-27 in the Melita-Pipestone-Broomhill area;
9) 1-26 to 3-26, 1-27 & 2-27 in the Souris River valley south of Melita;
10) 3-28, 4-28 & 5-28 (the "Poverty Plains" region northeast of Pierson); and
11) 1-29 & 2-29 in the Lyleton-Pierson area.

3.1.2) Key townships for Burrowing Owls

Areas with suitable habitat for Burrowing Owls are reflected by townships that were extensively searched during May and early June (Appendix I). These included grasslands in the following areas:

1) Snowflake (1-10);
2) north of Belmont to Treesbank (6-15 & 7-16);

3) Ninga (3-18);
4) south and west of Brandon (9-18, 10-18, 9-19, 10-19, 8-20 & 10-20);
5) north of Griswold (10-22 & 11-22);
6) Boissevain-Whitewater Lake (3-20 & 3-21);
7) south of Deloraine to west of Elgin (2-23 to 4-23, 4-22 & 5-22);
8) Deleau area (7-23 & 8-23);
9) Goodlands-Waskada (1-24, 2-24 & 2-25);
10) Medora-Lauder-Napinka (4-24, 5-24 & 4-25);
11) near the Lauder Sandhills (5-25 & 6-25);
12) Pipestone to Oak-Plum Lakes (7-25, 8-25, 7-26 & 8-26);
13) Melita-Pipestone-Broomhill (4-26, 5-26, 6-26, 4-27 & 5-27);
14) the Souris River valley south of Melita (1-26 to 3-26, 1-27 & 2-27);
15) the Poverty Plains (3-28, 4-28 & 5-28); and
16) Lyleton-Pierson (1-29 & 2-29).

## 3.2 Ferruginous Hawk

### 3.2.1) Status\Distribution

A total of 48 nesting pairs of Ferruginous Hawks were found in southwestern Manitoba during 1991 (Appendix II). This was down 14% from the 56 nesting pairs found during 1990; the first time populations have declined since the species was first found nesting in the province in 1982 (Table 1). In addition to nesting pairs, adults and subadults were observed or reported in 27 other sites (Appendix III).

The 1987-1991 nesting distribution of Ferruginous Hawks in Manitoba is shown in Figure 2. In 1991, Ferruginous Hawks nesting pairs occurred north to Brandon (2 pairs) and east to Treesbank. No pairs nested near Lenore, Glenboro-Hilton or Holmfield (peripheral sites that each supported two nesting pairs in 1990). Losses were also apparent in most of the major nesting areas (Table 2). In the Chain Lakes area, the number of nesting pairs remained at five, but declines were evident immediately northeast (no nests northeast of

Figure 2. Distribution of Ferruginous Hawks during 1987-1991 based on the number of nesting records or sightings per township.

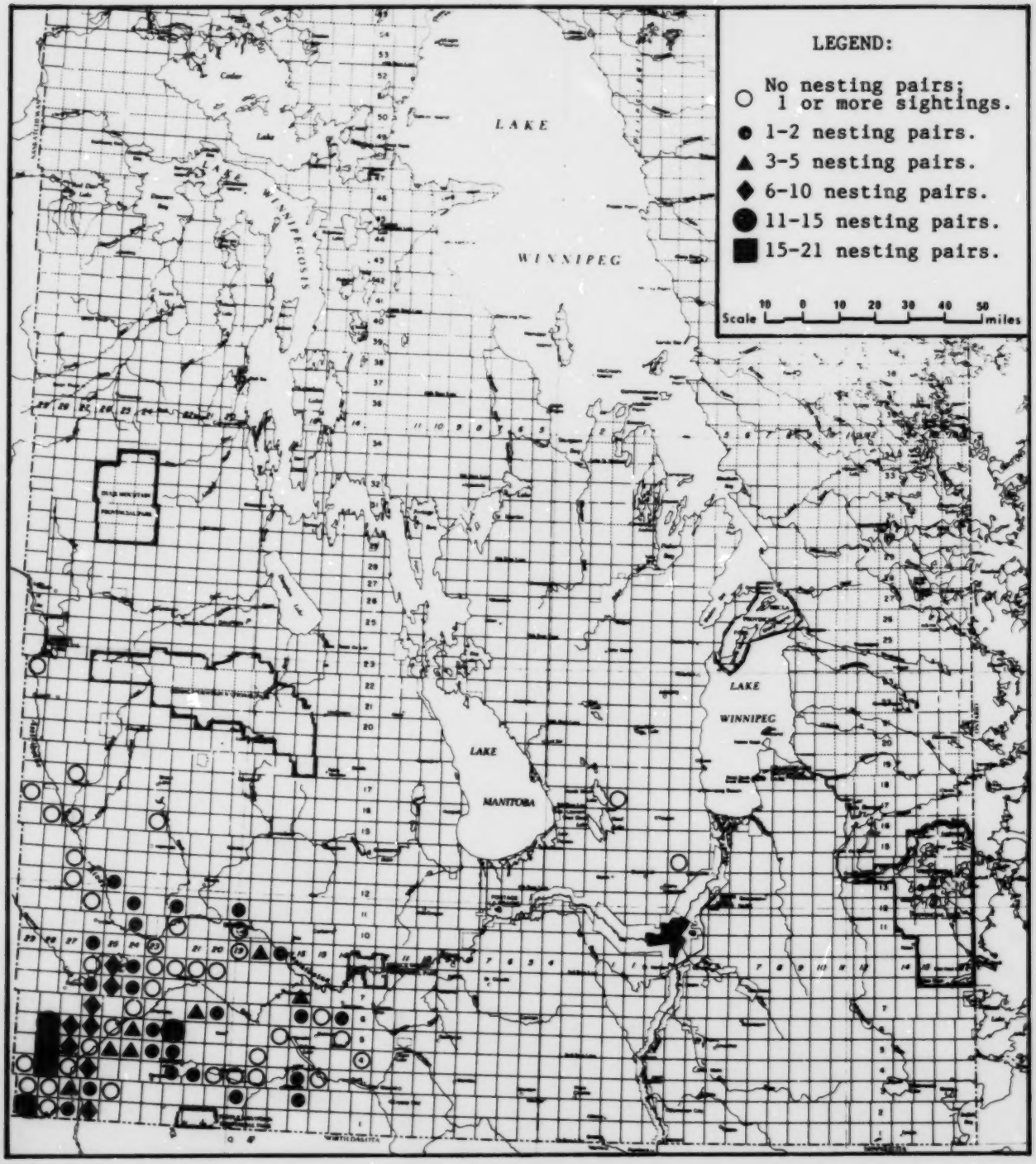


Table 1. Ferruginous Hawk nesting and banding data in Manitoba, 1987-1991 (from De Smet and Conrad 1989a, 1990; De Smet 1991, present study).

| | 1987 | 1988 | 1989 | 1990 | 1991 | Totals (1987-91) |
|---|---|---|---|---|---|---|
| **NESTING DATA** | | | | | | |
| No. nesting pairs | 11 | 32 | 35 | 56 | 48 | 182 |
| % nests reoccupied | - | 55 | 28 | 42 | 30 | 34.9 |
| % territories reoccupied | - | 73 | 59 | 76 | 63 | 65.9 |
| **NESTING SUCCESS** | | | | | | |
| No. pairs successful | 7 | 16 | 21 | 27 | 29 | 100 |
| % pairs successful | 64 | 50 | 64 | 48 | 60 | 55.6 |
| No. young fledged | 19 | 42 | 59 | 83 | 78 | 281 |
| Average brood size | 2.7 | 2.6 | 2.8 | 3.1 | 2.7 | 2.81 |
| No. young/nesting pair | 1.7 | 1.3 | 1.8 | 1.5 | 1.6 | 1.56 |
| **BANDING DATA** | | | | | | |
| No. young banded | 16 | 42 | 58 | 78 | 76 | 270 |
| No. returning juveniles | - | 0 | 1 | 0 | 1 | 2 |
| **NEST STRUCTURES** | | | | | | |
| Nest structures used | 0 | 2 | 0 | 9 | 12 | 23 |
| New structures erected | 64 | 0 | 39 | 30 | 58 | 191 |

Table 2. Ferruginous Hawk nesting densities in Manitoba, 1987-1991 (# of nests) and nest success (Y/N = # young produced/ # successful nests).

| Area & Township | 1987 | | 1988 | | 1989 | | 1990 | | 1991 | | Totals | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | Y/N | # | Y/N | # | Y/N | # | Y/N | # | Y/N | # | Y/N |
| Glenboro-Treesbank | | | | | | | | | | | | |
| 6-14 | - | - | - | - | - | - | 1 | 0 | - | - | 1 | 0 |
| 6-16 | - | - | 1 | 0 | - | - | 1 | 0 | - | - | 2 | 0 |
| 7-16 | - | - | 1 | 0 | - | - | 1 | 1/1 | 1 | 0 | 3 | 1/1 |
| Holmfield-Killarney | | | | | | | | | | | | |
| 2-16 | - | - | - | - | - | - | 1 | 1/1 | - | - | 1 | 1/1 |
| 3-16 | - | - | - | - | - | - | 1 | 1/1 | - | - | 1 | 1/1 |
| Brandon area | | | | | | | | | | | | |
| 9-17 | - | - | 1 | 1/1 | - | - | - | - | - | - | 1 | 1/1 |
| 9-18 | - | - | - | - | 1 | 3/1 | 2 | 5/1 | 1 | 3/1 | 4 | 11/3 |
| 11-19 | - | - | - | - | - | - | 1 | 0 | 1 | 0 | 2 | 0 |
| Ninga-Boissevain | | | | | | | | | | | | |
| 2-19 | - | - | - | - | 1 | 0 | - | - | - | - | 1 | 0 |
| Boissevain-Whitewater Lake | | | | | | | | | | | | |
| 3-20 | - | - | - | - | + | + | - | - | - | - | + | + |
| 3-21 | - | - | - | - | - | - | 1 | 0 | - | - | 1 | 0 |
| 3-22 | - | - | - | - | - | - | - | - | 1 | 0 | 1 | 0 |
| NE of Elgin | | | | | | | | | | | | |
| 6-20 | - | - | - | - | - | - | 1 | 0 | - | - | 1 | 0 |
| 6-21 | - | - | 1 | 2/1 | 1 | 2/1 | 1 | 4/1 | - | - | 3 | 8/3 |
| N of Griswold | | | | | | | | | | | | |
| 11-22 | - | - | 1 | 0 | - | - | - | - | - | - | 1 | 0 |
| Chain Lakes | | | | | | | | | | | | |
| 4-22 | - | - | - | - | - | - | - | - | 1 | 0 | 1 | 0 |
| 5-22 | - | - | 1 | 0 | 3 | 6/2 | 4 | 9/2 | 3 | 5/2 | 11 | 20/6 |
| 4-23 | - | - | - | - | - | - | 1 | 4/1 | 1 | 3/1 | 2 | 7/2 |
| 5-23 | - | - | 1 | 3/1 | 1 | 0 | - | - | - | - | 2 | 3/1 |
| Medora-Lauder-Napinka | | | | | | | | | | | | |
| 4-24 | - | - | - | - | 1 | 3/1 | 2 | 1/1 | 1 | 4/1 | 4 | 8/3 |
| 5-24 | - | - | 1 | 0 | 1 | 0 | 2 | 3/1 | - | - | 4 | 3/1 |
| 4-25 | - | - | - | - | 1 | 4/1 | 1 | 4/1 | 1 | 3/1 | 3 | 11/3 |
| Oak Lake-Lenore | | | | | | | | | | | | |
| 10-24 | - | - | 1 | 0 | - | - | - | - | - | - | 1 | 0 |
| 11-24 | - | - | - | - | 1 | 0 | 1 | 0 | - | - | 2 | 0 |
| 12-25 | - | - | - | - | - | - | 1 | 0 | - | - | 1 | 0 |
| Pipestone-Oak & Plum Lakes | | | | | | | | | | | | |
| 8-24 | - | - | - | - | + | + | - | - | 1 | 0 | 1 | 0 |
| 7-25 | - | - | - | - | 1 | 2/1 | 2 | 4/1 | 4 | 6/2 | 7 | 12/4 |
| 8-25 | - | - | 1 | 0 | 1 | 3/1 | 1 | 0 | 3 | 2/1 | 6 | 5/2 |
| 9-26 | - | - | - | - | - | - | 1 | 0 | - | - | 1 | 0 |
| S of Melita | | | | | | | | | | | | |
| 1-26 | - | - | 1 | 4/1 | 2 | 3/1 | 1 | 0 | 1 | 2/1 | 5 | 9/3 |
| 2-26 | - | - | - | - | - | - | 1 | 0 | 1 | 0 | 2 | 0 |
| 3-26 | - | - | 1 | 2/1 | 1 | 4/1 | 3 | 8/3 | 2 | 4/2 | 7 | 18/7 |
| 1-27 | - | - | 1 | 1/1 | - | - | - | - | - | - | 1 | 1/1 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 2-27 | - | - | 1 | 0 | 1 | 2/1 | 1 | 0 | 1 | 0 | 4 | 2/1 |
| Melita-Pipestone-Broomhill | | | | | | | | | | | | |
| 5-26 | - | - | 2 | 0 | - | - | 1 | 0 | 3 | 3/1 | 6 | 3/1 |
| 6-26 | - | - | 1 | 0 | 2 | 4/1 | 3 | 7/2 | 2 | 2/1 | 8 | 13/4 |
| 7-26 | - | - | - | - | 1 | 1/1 | - | - | - | - | 1 | 1/1 |
| 4-27 | 1 | 4/1 | 1 | 5/1 | 1 | 4/1 | 1 | 2/1 | 2 | 4/2 | 6 | 19/6 |
| 5-27 | - | - | 1 | 0 | 2 | 0 | 2 | 2/1 | 3 | 9/3 | 8 | 11/4 |
| Poverty Plains | | | | | | | | | | | | |
| 3-28 | 3 | 4/2 | 4 | 13/4 | 3 | 7/3 | 5 | 15/4 | 4 | 10/3 | 19 | 49/16 |
| 4-28 | 3 | 3/1 | 4 | 7/3 | 3 | 5/2 | 5 | 4/1 | 6 | 12/5 | 21 | 31/12 |
| 5-28 | 2 | 4/2 | 2 | 1/1 | 2 | 6/2 | 3 | 5/2 | 2 | 2/1 | 11 | 18/8 |
| Lyleton-Pierson | | | | | | | | | | | | |
| 1-29 | 2 | 4/1 | 3 | 3/1 | 2 | 0 | 3 | 3/1 | 2 | 4/1 | 12 | 14/4 |
| TOTALS: | 11 | 19/7 | 32 | 42/16 | 33 | 59/21 | 56 | 83/27 | 48 | 78/29 | 180 | 281/100 |

Elgin versus two in 1990) and west (two pairs in the Medora-Lauder-Napinka area versus five in 1990). Slight losses were noted in the Souris River valley south of Melita (down from six to five pairs), in the Lyleton-Pierson grasslands (down from three to two pairs), and in the Poverty Plains north of Pierson (down from 13 to 12 nesting pairs). Only the Broomhill to Oak-Plum Lakes area (townships 4-27, 5-27, 5-26, 6-26, 7-25, 8-25 and 8-24) experienced an overall increase in nesting pairs (from 10 to 18).

Houston and Bechard (1984) documented a decline in Ferruginous Hawk numbers in the early 1940's coincident with a crash in their main prey item, the Richardson's ground squirrel, and the return of wet conditions after a decade of drought. During the late 1980's, drought conditions were prevalent throughout southwestern Manitoba and in much of the Northern Great Plains. Many landowners in southwestern Manitoba commented on how plentiful hawk and ground squirrel populations had become. When the current drought subsides, however, declines in both ground squirrel and Ferruginous Hawk populations may occur. In 1991, for example, moisture conditions were closer to long-term averages. This coincided with a decline in Ferruginous Hawk nesting populations and productivity throughout the Prairie Provinces (this study, S. Houston pers. comm., J. Schmutz pers. comm.).

3.2.2) Nest site characteristics

The majority of 1991 nests were in the same site as in 1990 (n=17, including two that have been used every year since 1987) or were within 1.6 km (1 mile) of the 1990 nest site (n=18; these would include many pairs that used alternate nests within their former nesting territory). Only 13 nests were in "new" sites (areas where nests have not been previously found), compared to 1990 when half of the nests were in new sites (De Smet 1991). Over three-quarters of the 1991 nests were in cottonwoods (Populus deltoides; n=17), maple (Acer negundo; n=12) or trembling aspen (P. tremuloides; n=9) (Appendix II). Most of the remaining nests were in willow (Salix spp.) shrubs (n=3) or willow trees (n=3).

Since 1987, 64% of the nesting territories, including 34% of the nests, have been reoccupied from one year to the next (Table 1). Nest reoccupancy rates have been found to be largely influenced by nesting success in the previous year. Since 1987, over half of the successful nests (37 of 71) have been reused the following year, whereas only 9 of 63 unsuccessful nests (14%) were reused.

Use of artificial nest structures during 1991 was encouraging; 12 pairs (25%) nested in modified nests or structures (Appendix II). Occupied nest structures included six wire baskets and one modified nest from 1990, one wooden platform and two stick bases from 1989, and single wooden platforms from 1987 and 1983. In 1991, 58 additional nest structures were erected (Appendix IV). Three were modified raptor nests; the remainder consisted of a basket made of 2-inch stucco wire and filled with twigs. Surrounding branches were cleared to present an enhanced view of the surrounding landscape and an unobstructed path in and out of the nest. Nest structures were situated in "isolated" trees (usually well-spaced from yards, roads or other potential disturbances, and generally removed from nearby trees or shrubs) and were near extensive pastures with abundant ground squirrels. Many were near failed or historic Ferruginous nests or in areas where adults have previously been seen. Nest structures were usually placed in large, stable trees (mostly in cottonwoods) with a suitable fork about two-thirds of the way up the main trunk. Since Manitoba's Ferruginous Hawks have experienced better nesting success in high nests (see Section 3.2.3), more than half of the structures were situated at heights of 9 m (30 ft) or more, and few were placed lower than 6 m (20 ft). Several structures were built within 1 km of an active nest; these may serve as alternate nests, especially if existing nests fall down or are used by Great Horned Owls (Bubo virginianus). Among 56 Ferruginous Hawk nests from 1990, for example, 13 fell (including seven where the nest tree or shrub broke), three were used by Great Horned Owls (and would thus be occupied prior to when Ferruginous Hawks return from their wintering grounds) and at least two nests were taken over by Red-tailed Hawks (Buteo jamaicensis).

3.2.3) Nest success\Productivity\Banding

Nesting success during 1991 (60%) was slightly better than the 56% overall success witnessed since 1987 (Table 1). Because a large proportion of the nests were found early in the nesting cycle, some nest failures were recorded that would likely have gone unnoticed during other years when the majority of nests were found later in the nesting season. Three of the losses occurred when high winds toppled nests or broke nest trees. Unhatched eggs were found in five nests during banding activities. At least one clutch was deserted; others may have been deserted and the eggs subsequently disappeared before the nest was visited. As in previous years, many losses were attributed to depredation; this was especially prominent among pairs that nested in new sites (perhaps first-time, inexperienced pairs) or those nesting near active magpie (Pica pica) nests.

Survival of young was high; few dead chicks were found under active nests (a common occurrence during some years) and only two nests incurred complete brood losses. Nevertheless, less than one-quarter (7) of the 29 successful pairs during 1991 raised 4-5 young (Appendix II), compared to nearly half of the successful pairs raising 4-5 young during 1990 (De Smet 1991). On the other hand, only 10% of the successful pairs during 1991 raised one young, compared to 22% during 1990. Total productivity at banding age (2.7 per successful nest or 1.6 per initiated nest) was comparable to long-term averages (Table 1).

Regional differences in nesting success and densities of Ferruginous Hawks from 1987 to 1991 are presented in Table 2. Productivity for 35 peripheral nests (north of township 7 and east of range 22; X=0.80) has been much lower than for 145 nests in the extreme southwest (X=1.74). Productivity has been highest in the Poverty Plains (X=1.92; n=51) and in the Napinka-Chain Lakes (X=1.93; n=27). These two areas also support the densest nesting populations; the Poverty Plains have consistently had high nesting densities, but populations in the Chain Lakes have established since 1987.

Average nesting success for Ferruginous Hawks since 1987 has been highest for nests in cottonwood (71%, n=45) and aspen (67%, n=42); compared to a 44% success rate for 93 nests in other tree or shrub

species. Overall productivity (# young/initiated nest) has also been superior for nests in cottonwoods (X=2.18) and aspen (X=1.74); compared to an average 1.19 young/nest in other trees and shrubs. Higher nests have also experienced better nesting success and productivity; 69% of 59 nests >8 m in height were successful, producing an average of 2.00 young/initiated nest, compared to 58% success and 1.58 young for 5-8 m nests (n=57) and 42% success and 1.20 young in nests lower than 5 m (n=59).

Since 1987, a total of 270 juvenile Ferruginous Hawks have been banded in Manitoba (Table 1). During 1991, 76 juveniles were banded with a USFWS aluminum band on the right leg (to which was attached a yellow, numbered vinyl tag). Of 40 adults checked for bands, only one was banded -- the nesting female at NW26-4-28 had been banded as a nestling during 1988 at NE22-4-28 (2 km SW).

## 3.3 Burrowing Owl

### 3.3.1) Status\Distribution

Burrowing Owls were first observed on 23 April; by this date the marked pair from 1989 and 1990 was back on territory at SE23-1-27, and another adult was noted at NW13-1-29. Cool spring and early summer temperatures provided ideal survey conditions well into June. Consequently, surveys were extended to areas that had not been adequately censused in previous years. Repeated visits were made to sites that were considered ideal for Burrowing Owls (see Appendix V). A total of 23 pairs and 10 single adults were found (Appendix VI). Several other potential nesting pairs were reported by reliable observers (Appendix VII). Many of the reported pairs departed soon after they were sighted (possibly migrants) or the report was received after they had already failed and left. Despite extended surveys, nesting totals were similar to those from 1990 (19 pairs and 7 singles) and down from totals for 1989 (34 pairs) and 1988 (28 pairs, 6 singles) (Table 3). Hence, it appears that Burrowing Owl populations are continuing to decline in southwestern Manitoba.

The 1987-1991 nesting distribution of Burrowing Owls in Manitoba is shown in Figure 3. In 1991, Burrowing Owls were found north and east to

Kemnay (township 10-20), Dunrea (5-18) and Snowflake (1-10). The Snowflake nesting pair represents a recent eastward range extension. Occasional reports from near Winnipeg, and regular reports from the Gladstone area, indicate that other pairs may still nest in southeastern Manitoba. It is interesting to note that although suitable habitat is available in these areas, extralimital sightings usually occur in cropland, haylands, along drainage ditches or in other atypical habitats.

Remaining populations in Manitoba are concentrated in the extreme southwest; two-thirds were found in the 20 townships south and west of 5-26 (Table 4). As in former years, populations were most concentrated in township 5-26 (three pairs and one single), in the Lyleton-Pierson area (two pairs and three singles in 1-29 & 2-29), in the Lauder-Medora area (two pairs and two singles in 4-24), and south of the Oak-Plum Lakes (two pairs and a single in 7-25 & 8-25). Three pairs were found in extensive grasslands within the Souris River valley south of Melita, a suitable area where owls have rarely been noted in previous years. No Burrowing Owls were found in three areas that supported healthy populations in the late 1980's (2-23 & 3-23 near Deloraine; 5-24, 4-25 &5-25 in the Lauder-Napinka area; and 6-26 near Pipestone) (Table 4). Even in areas where Burrowing Owls are still found in reasonable numbers, significant declines have occurred since 1982-1984 (Ratcliff 1986). In the Lauder-Medora area (township 4-24), populations declined from 21 pairs in 1982-1984 to 14 pairs, 6 singles from 1987-1991. Near Pipestone (township 6-26), numbers declined from 13 pairs, 2 singles in 1982-1984 to 4 pairs, 1 single in 1987-1991. Near Broomhill (4-27 & 5-27), populations shrank from 9 pairs, 3 singles in 1982-1984 to 5 pairs, 2 singles in 1987-1991. In the Lyleton-Pierson area (1-29 & 2-29),there were 24 pairs, 6 singles in 1982-1984 compared to 15 pairs, 6 singles in 1987-1991. Other areas where more precipitous declines have occurred since 1982-1984 include:

Figure 3. Distribution of the Burrowing Owl in Manitoba during 1987-1991 based on the total number of nesting pairs or sightings per township.

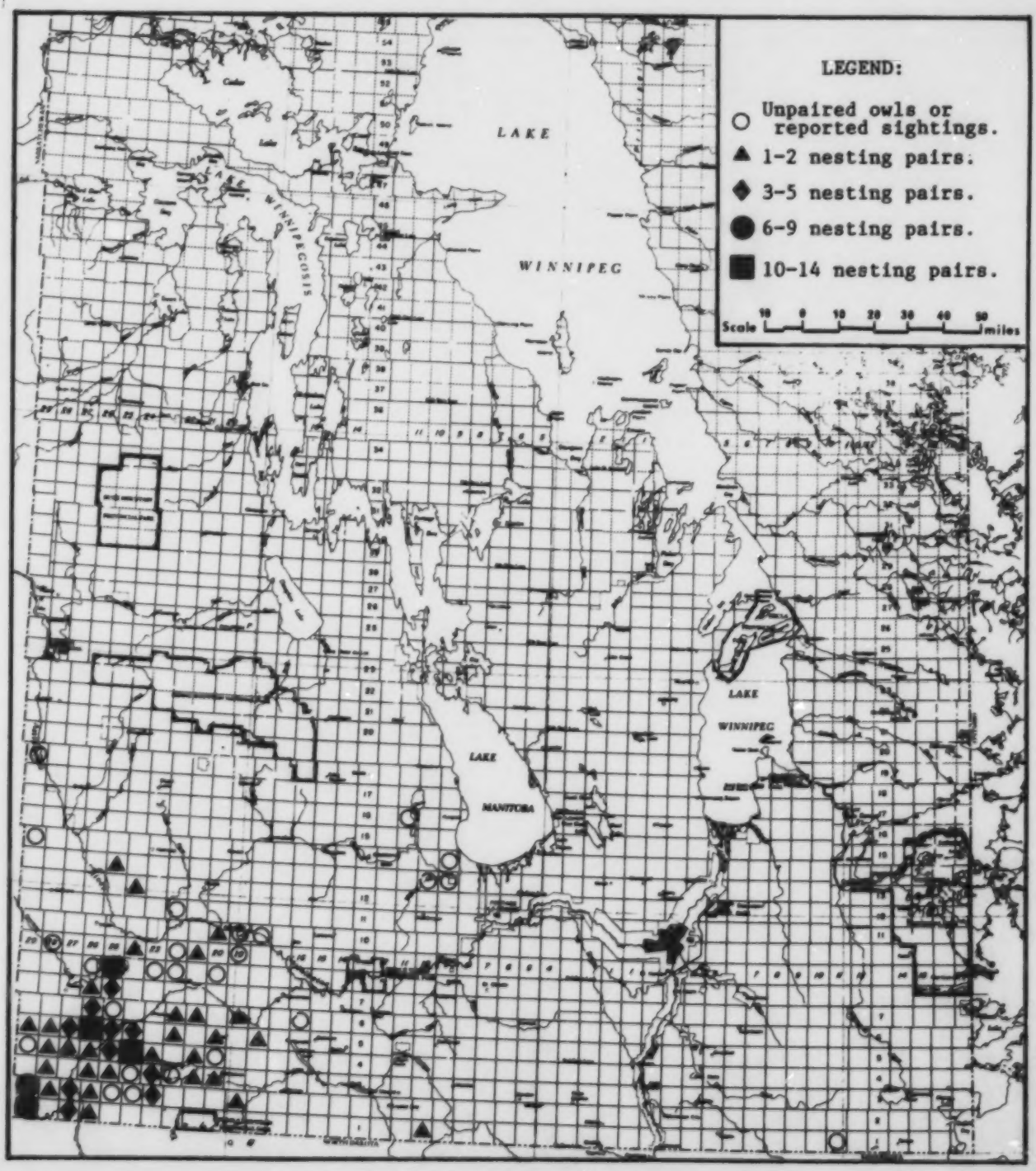


Table 3. Burrowing Owl nesting, banding and reintroduction data in Manitoba, 1987-1991 (from unpublished data, Haug and Churchward 1989; De Smet and Conrad 1990; De Smet 1991, present study).

| | 1987 | 1988 | 1989 | 1990 | 1991 | Totals (1987-91) |
|---|---|---|---|---|---|---|
| **NESTING DATA** | | | | | | |
| No. breeding pairs | 14 | 28 | 34 | 19 | 23 | 118 |
| No. singles | 6 | 6 | 0 | 7 | 10 | 29 |
| % territories reoccupied | - | 43 | 25 | 35 | 58 | 37.9 |
| **NESTING SUCCESS** | | | | | | |
| No. pairs successful | 12 | 19 | 26 | 17 | 14 | 88 |
| % pairs successful | 86 | 68 | 76 | 89 | 61 | 74.6 |
| No. young produced | 70 | 106 | 121 | 99 | 88 | 484 |
| Average brood size | 5.8 | 5.6 | 4.7 | 5.8 | 6.3 | 5.50 |
| No. young/nesting pair | 5.0 | 3.8 | 3.6 | 5.2 | 3.8 | 4.10 |
| **BANDING DATA** | | | | | | |
| No. young banded | 62 | 72 | 109 | 93 | 81 | 417 |
| No. adults banded | 0 | 4 | 31 | 11 | 8 | 54 |
| No. returning juveniles | - | 2 | 2 | 4 | 10 | 18 |
| No. returning adults | - | 0 | 1 | 10 | 8 | 19 |
| **REINTRODUCTIONS** | | | | | | |
| Young released & banded | 16 | 32 | 23 | 48 | 50 | 169 |
| Ads. released & banded | 2 | 7 | 5 | 4 | 0 | 18 |

Table 4. Burrowing Owl nesting densities in Manitoba, 1987-1991 (# of pairs; singles in parenthesis) and nest success (Y/N = # young fledged/ # successful nests).

| Area & Township | 1987 | | 1988 | | 1989 | | 1990 | | 1991 | | Totals | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | Y/N | # | Y/N | # | Y/N | # | Y/N | # | Y/N | # | Y/N |
| **Snowflake** | | | | | | | | | | | | |
| 1-10 | - | - | - | - | - | - | - | - | 1 | 0 | 1 | 0 |
| **Dunrea-Minto** | | | | | | | | | | | | |
| 5-18 | - | - | - | - | - | - | - | - | 1 | 0 | 1 | 0 |
| 6-19 | - | - | 1 | 1/1 | - | - | - | - | - | - | 1 | 1/1 |
| 5-20 | - | - | 1 | 0 | - | - | - | - | - | - | 1 | 0 |
| **Brandon-Beresford** | | | | | | | | | | | | |
| 10-19 | - | - | (1) | - | - | - | - | - | - | - | (1) | - |
| 10-20 | - | - | - | - | - | - | 1(1) | 3/1 | (1) | 0 | 1(2) | 3/1 |
| 9-21 | - | - | 1 | 6/1 | 1 | 5/1 | - | - | - | - | 2 | 11/2 |
| **Boissevain-Whitewater Lake** | | | | | | | | | | | | |
| 2-19 | - | - | - | - | 1 | 2/1 | - | - | - | - | 1 | 2/1 |
| 3-20 | - | - | - | - | 1 | 5/1 | - | - | - | - | 1 | 5/1 |
| 3-21 | - | - | - | - | - | - | 1 | 1/1 | 1 | 0 | 2 | 1/1 |
| 4-21 | - | - | - | - | 1 | 4/1 | - | - | - | - | 1 | 4/1 |
| 3-22 | - | - | - | - | - | - | (1) | - | - | - | (1) | - |
| **NW of Elgin** | | | | | | | | | | | | |
| 6-21 | (1) | - | 1 | 0 | - | - | - | - | - | - | 1(1) | 0 |
| 5-22 | - | - | 1 | 0 | - | - | - | - | - | - | 1 | 0 |
| 6-22 | - | - | - | - | - | - | - | - | 1 | 0 | 1 | 0 |
| **Deloraine area** | | | | | | | | | | | | |
| 2-23 | 2 | 11/2 | 1(1) | 2/1 | - | - | - | - | - | - | 3(1) | 13/3 |
| 3-23 | 1 | 0 | 1(1) | 0 | 2 | 5/2 | - | - | - | - | 4(1) | 5/2 |
| 4-23 | - | - | - | - | 1 | 0 | - | - | - | - | 1 | 0 |
| **N of Waskada** | | | | | | | | | | | | |
| 2-25 | (1) | - | - | - | - | - | - | - | - | - | (1) | - |
| 3-25 | - | - | - | - | - | - | 1 | 0 | - | - | 1 | 0 |
| **Medora-Lauder-Napinka** | | | | | | | | | | | | |
| 4-24 | 2(3) | 16/2 | 4(1) | 26/4 | 4 | 20/3 | 2 | 14/2 | 2(2) | 7/1 | 14(6) | 83/12 |
| 5-24 | 1 | 0 | 1 | 6/1 | 1 | 5/1 | (1) | - | - | - | 3(1) | 11/2 |
| 4-25 | 1 | 4/1 | - | - | 4 | 0 | - | - | - | - | 5 | 4/1 |
| 5-25 | - | - | 1 | 7/1 | 1 | 7/1 | 1 | 8/1 | - | - | 3 | 22/3 |
| **Kenton-Lenore** | | | | | | | | | | | | |
| 12-24 | - | - | - | - | 1 | 4/1 | - | - | - | - | 1 | 4/1 |
| 13-25 | - | - | - | - | - | - | 1 | 8/1 | - | - | 1 | 8/1 |
| **Pipestone-Oak Lake** | | | | | | | | | | | | |
| 9-24 | - | - | - | - | 1 | 5/1 | 1 | 0 | - | - | 2 | 5/1 |
| 7-25 | - | - | 2 | 11/2 | - | - | - | - | 1 | 0 | 3 | 11/2 |
| 8-25 | 1 | 6/1 | 3 | 14/2 | 2 | 10/2 | (1) | - | 1(1) | 7/1 | 7(2) | 37/6 |
| 7-26 | - | - | 1 | 5/1 | - | - | - | - | - | - | 1 | 5/1 |
| **S of Melita** | | | | | | | | | | | | |
| 1-26 | - | - | - | - | - | - | - | - | 1 | 3/1 | 1 | 3/1 |
| 2-26 | 2 | 10/2 | - | - | - | - | - | - | - | - | 2 | 10/2 |
| 3-26 | - | - | - | - | - | - | - | - | 1 | 8/1 | 1 | 8/1 |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1-27 | - | - | - | - | 1 | 6/1 | 1 | 5/1 | 1 | 7/1 | 3 | 18/3 |
| 2-27 | 1 | 7/1 | - | - | 1 | 4/1 | 1 | 5/1 | 2 | 4/1 | 5 | 20/4 |
| Melita-Pipestone-Broomhill | | | | | | | | | | | | |
| 4-26 | - | - | - | - | - | - | - | - | 1 | 7/1 | 1 | 7/1 |
| 5-26 | - | - | - | - | 2 | 7/2 | 5 | 35/5 | 3(1) | 16/2 | 10(1) | 58/9 |
| 6-26 | 1 | 4/1 | 1 | 4/1 | 2 | 6/1 | (1) | - | - | - | 4(1) | 14/3 |
| 4-27 | - | - | 1 | 7/1 | - | - | - | - | 1 | 0 | 2 | 7/1 |
| 5-27 | (1) | - | 1 | 7/1 | 1 | 6/1 | (1) | - | 1 | 7/1 | 3(2) | 20/3 |
| Poverty Plains | | | | | | | | | | | | |
| 3-28 | - | - | - | - | 1 | 6/1 | 1 | 6/1 | - | - | 2 | 12/2 |
| 4-28 | - | - | - | - | 1 | 0 | - | - | 1(2) | 6/1 | 2(2) | 6/1 |
| 5-28 | - | - | - | - | 1 | 4/1 | - | - | - | - | 1 | 4/1 |
| Lyleton-Pierson | | | | | | | | | | | | |
| 2-28 | - | - | - | - | - | - | - | - | 1 | 6/1 | 1 | 6/1 |
| 1-29 | 1 | 5/1 | 2(2) | 0 | 1 | 3/1 | 2 | 12/2 | 1(3) | 6/1 | 7(5) | 26/5 |
| 2-29 | 1 | 7/1 | 3 | 5/1 | 2 | 7/2 | 1(1) | 2/1 | 1 | 4/1 | 8(1) | 25/6 |
| Tilston area | | | | | | | | | | | | |
| 5-29 | - | - | 1 | 5/1 | - | - | - | - | - | - | 1 | 5/1 |
| TOTALS: | 14(6) | 70/12 | 28(6) | 106/19 | 34(0) | 121/26 | 19(7) | 99/17 | 23(10) | 88/14 | 118(29) | 484/88 |

1) the Brandon area -- townships 9-19 & 10-19 (7 pairs, 5 singles in 1982-1984 versus 1 single in 1987-1991);
2) the Goodlands-Waskada area -- 1-24 to 3-24 & 1-25 to 3-25 (32 pairs, 6 singles in 1982-1984 versus 1 pair, 1 single from 1987-1991); and
3) near Melita -- 3-26 & 4-26 (7 pairs, 4 singles in 1982 versus 2 pairs from 1987-1991).

Many of the 1990 sites were reoccupied during 1991, including 58% of the nesting territories and 1 of 7 sites where single birds were seen. Three of these sites were reoccupied by only a single adult; four other pairs failed and left. This, plus low overall nest success during 1991, will likely result in low reoccupancy rates in 1992. Although 38% of the nesting territories from 1987 to 1990 were reoccupied the following year (Table 3), only 1 of 21 failed sites (5%) were reoccupied compared to nearly half (35 of 74) of the successful sites.

Scanning of suitable but traditionally unoccupied grasslands continues to yield a significant proportion of the owls that are found in any given year. In 1991, 15 "new" sites were found by scanning suitable grasslands compared to 12 sites that were reused and six "new" sites that were reported by landowners or the general public. Many of the owls that were found in "new" sites were in or near grasslands that had been previously identified as suitable for Burrowing Owls. Consequently, a list of these suitable areas was prepared, including 713 sites that were rated "very good" (n=81), "good" (n=401), or "fair" (n=231) habitat for Burrowing Owls based on field experience (Appendix V). Sites that were ranked as ideal usually contained short, sparse vegetation, abundant ground squirrels and numerous available burrows. This list has been compiled over the course of five field seasons and provides a useful database for future Burrowing Owl censuses.

3.3.2) Nest success\Productivity

Nest success rates were lower than in any year since 1987. Only 14 pairs (61%) produced young during 1991, compared with 75% of 118 nesting pairs that have been successful since 1987 (Table 3). Reasons were not apparent, although predators, vehicular collisions, and grasshopper spraying probably contributed. Depredation on nests or adults by

badger, fox, coyote and skunk (all of which are relatively numerous and are concentrated in remaining habitat), may have contributed to losses where both of the adult owls disappeared between visits. The disappearance of three other adults during early brood-rearing (shortly after the young had emerged) suggested that adult mortality at this stage of the nesting cycle was high. All three had nested within 75 m of a major road; one of the missing adults was eventually found dead along a highway 1 km from the nest. Early disappearance of one of the adults during early brood-rearing has also been noted in previous years and usually results in desertion of the site in subsequent years.

Although nesting success was low, productivity of successful pairs was higher than in any previous year. Brood sizes at banding age ranged from 3-9 young and averaged 6.3 young/brood, well above the 5.5 young/brood average for 1987-1991 (Table 3) and the 3.9 young/brood average for 1982-1984 (Ratcliff 1986).

3.3.3) Banding\Return rates

Of 88 young fledged, 81 were banded with a blue numbered wrap-around band over the USFWS aluminum band on the right leg, and a white numbered wrap-around band on the left leg. An additional 50 juveniles from North Dakota (that were released in Manitoba) were banded in similar fashion. Eight previously unbanded adults from Manitoba were caught and banded with a red numbered wrap-around band over USFWS aluminum on the right leg and a white numbered wrap-around band on the left leg. This brings the total number of Burrowing Owls banded in Manitoba since 1987 to 417 juveniles and 54 adults (Table 3).

Return rates of previously banded adults and juveniles were monitored. Of 53 adults that were checked for bands, over one-third (18) were banded previously. These included 8 (4 males and 4 females) that were banded as adults during 1989 and 1990, and 10 (7 males, 3 females) that had been banded as juveniles during 1988-1990 (Appendix VI). This year for the first time, two adults were found in sites well-removed from where they had previously nested -- a female that successfully nested at 6-1-29 in 1989 was found at 2-4-28 (32 km S), and

a nesting female from 34-5-26 had successfully nested at 27-6-26 (8 km N) in 1989 and had subsequently been observed at 27-6-26 and at 9-3-22 during 1990 (De Smet 1991). Four other nesting adults from 1989 and two adults from 1990 were at the same site where they had been banded. Of 25 banded adults that were on territory during 1990, less than one-third (n=8 or 32%) were found during 1991. This was similar to a 29% return rate of adults noted during 1990 (De Smet 1991). Both adults were banded at seven nests that were successful during 1990. No owls returned at two of these sites, the male returned with a different female at three sites, the female returned with a different male at one site, and both owls returned at the seventh site. Although some of the missing adults may have returned to the general area and were not found, these low return rates suggest that elevated adult mortality may be contributing to declines of the species in Manitoba.

Return rates of juveniles were higher in 1991 than in any previous year. Ten of the returning owls had been banded as juveniles, including seven (five males, two females) that were banded in 1990, two males from 1989, and one male from 1988. At least one male from the 1990 release returned and nested 6.4 km S of the reintroduction site. Another male that bore color bands identifying it as a 1990 juvenile disappeared before the band numbers were read. Among the other 1990 juveniles, two females nested 2.4 km SW and 16.5 km SE, one male nested 19.2 km NW, and single males were found 14.4 km SE and 26.4 km N of their natal sites. Juvenile males from 1989 nested 27.2 km S and 45.3 km SW of their natal sites, and the juvenile male from 1988 was at the same site where it nested in 1990 (78 km NE of its natal site). Given that a total of 141 juveniles were banded in Manitoba during 1990, seven resightings represents a 5% known return. This return rate was considerably better than the 0-2% returns observed during previous years (Table 3).

3.3.4) Cooperative Manitoba-North Dakota surveys and release

Spring surveys of 33 prairie dog colonies in southwestern North Dakota revealed that at least 15 (45%) were occupied by one or more owls (De Smet et al. 1991). A total of 87 Burrowing Owls were found including at least 36 pairs. Spring surveys were hampered by

unseasonably cold weather, time constraints and unusually shy behavior of the adult owls in these colonies. Return visits to five of the more productive sites in mid-July revealed more than twice as many adult owls than had been noted during spring surveys. A minimum of 32 family groups and 109 young were identified. Fifty young (16 partial family groups) were removed for release purposes and transported to the release site in southwestern Manitoba. This brings the total number of juvenile Burrowing Owls that have been released in Manitoba since 1987 to 169 (Table 3) -- prior to 1991, released owls have originated from Saskatchewan or from the Owl Research and Rehabilitation Facility in Vineland, Ontario.

The 1991 release site was located on a slight knoll in a native hayland (near extensive pastureland) on the Gervin property east of Broomhill (C15-5-27). The owls were placed in seven preconstructed release pens on 19 July and fed chopped up mice and rats on a twice-daily basis. The pens were removed on 1 August. The following day some owls were observed hunting up to 1 km from the release site, however, most remained in and around artificial nest burrows at the release site. Feeding at the release site continued until 16 August, at which time most of the owls had left. Pellets comprised of grasshoppers were found at the site one week after the release, indicating a gradual transition in the diet from mice to grasshoppers. Survival of released juveniles was excellent as only three were known to have perished.

## 3.4 Loggerhead Shrike

### 3.4.1) Status\distribution

In 1991, single Loggerhead Shrikes were first noted in southwestern Manitoba on 17 April; territorial pairs were first noted on 23 April. A total of 226 pairs or territorial adults were found in southern Manitoba, 20 other suspected pairs were reported (Appendix VIII). Despite increased survey effort, the 246 total pairs was down 9% from 1990 totals (Table 5). Since 1989, coverage has remained relatively constant in the northern half (townships 5-8, ranges 26-29) of the intensive study area, yet the number of shrikes in this half has declined 33% from 128 to 86 pairs (Table 6).

Table 5. Loggerhead Shrike nesting and banding data in Manitoba, 1987-1991 (from De Smet and Conrad 1987, 1989b, 1990; De Smet 1991, present study).

| | 1987 | 1988 | 1989 | 1990 | 1991 | Totals (1987-91) |
|---|---|---|---|---|---|---|
| **NESTING DATA** | | | | | | |
| No. nesting pairs | 265 | 232 | 261 | 270 | 246 | 1274 |
| No. nests found | 62 | 102 | 106 | 154 | 161 | 585 |
| No. complete clutches | 21 | 36 | 40 | 68 | 86 | 251 |
| Average clutch size | 5.7 | 6.1 | 6.4 | 6.3 | 6.3 | 6.24 |
| **NESTING SUCCESS** | | | | | | |
| No. nests monitored | 24 | 39 | 42 | 90 | 103 | 298 |
| No. successful | 11 | 22 | 32 | 59 | 75 | 199 |
| No. young fledged | 54 | 111 | 179 | 324 | 386 | 1054 |
| % nest success | 46 | 56 | 76 | 66 | 73 | 66.8 |
| Average brood size | 5.0 | 5.0 | 5.6 | 5.4 | 5.1 | 5.29 |
| Average young/nest | 2.3 | 2.8 | 4.3 | 3.6 | 3.7 | 3.54 |
| **BANDING DATA** | | | | | | |
| No. young banded | 95 | 350 | 401 | 542 | 610 | 1998 |
| No. adults banded | 0 | 2 | 0 | 3 | 37 | 42 |
| No. returning juveniles | - | 0 | 1 | 8 | 11 | 20 |
| No. returning adults | - | 0 | 1 | 0 | 0 | 1 |
| No. checked for bands | - | - | 193 | 309 | 308 | 810 |
| % birds checked=banded | - | - | 1.0 | 2.6 | 3.6 | 2.6 |

Table 6. Loggerhead Shrike nesting densities in Manitoba, 1987-1991 (# of pairs) and nest success (Y/N = young fledged/nests found with eggs and monitored until near fledging age).

| Township | 1987 | | 1988 | | 1989 | | 1990 | | 1991 | | Totals | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | # | Y/N | # | Y/N | # | Y/N | # | Y/N | # | Y/N | # | Y/N |
| 12-11E | - | - | 1 | - | - | - | - | - | - | - | 1 | - |
| 6-6E | - | - | 1 | - | - | - | - | - | - | - | 1 | - |
| 14-6E | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 10-4E | - | - | 1 | - | - | - | - | - | - | - | 1 | - |
| 11-4E | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 12-3E | 4 | - | 3 | - | 3 | - | 1 | 6/1 | 5 | - | 16 | 6/1 |
| 13-3E | - | - | - | - | - | - | 1 | - | 1 | - | 2 | - |
| 5-2E | - | - | - | - | - | - | - | - | 1 | - | 1 | - |
| 6-2E | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 9-2E | - | - | - | - | - | - | - | - | 1 | - | 1 | - |
| 11-2E | - | - | - | - | - | - | 1 | - | 1 | - | 2 | - |
| 15-2E | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 10-1E | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 13-1E | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 14-1E | - | - | - | - | - | - | 2 | - | - | - | 2 | - |
| 15-1E | 1 | - | - | - | - | - | 1 | - | - | - | 2 | - |
| 1-1W | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 21-5 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 12-7 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 13-7 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 1-8 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 17-10 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 15-11 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 2-13 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 5-13 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 2-14 | 1 | - | - | - | 1 | - | - | - | - | - | 2 | - |
| 6-14 | - | - | 1 | - | - | - | 1 | - | - | - | 2 | - |
| 1-15 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 2-15 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 5-15 | - | - | - | - | - | - | - | - | 1 | - | 1 | - |
| 6-15 | - | - | - | - | - | - | - | - | 1 | - | 1 | - |
| 3-16 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 8-16 | - | - | - | - | - | - | - | - | 1 | - | 1 | - |
| 1-17 | - | - | - | - | - | - | 2 | 0/1 | - | - | 2 | 0/1 |
| 6-17 | - | - | - | - | - | - | - | - | 1 | 6/1 | 1 | 6/1 |
| 10-17 | 1 | - | - | - | 2 | 6/1 | - | - | 1 | - | 4 | 6/1 |
| 2-18 | - | - | - | - | - | - | 1 | - | 1 | - | 2 | - |
| 3-18 | 2 | - | - | - | - | - | 1 | - | 2 | 5/2 | 5 | 5/2 |
| 5-18 | - | - | - | - | - | - | - | - | 1 | - | 1 | - |
| 9-18 | - | - | 1 | - | 1 | - | 1 | - | - | - | 3 | - |
| 10-18 | 2 | - | - | - | 2 | - | - | - | - | - | 4 | - |
| 12-18 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 2-19 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 3-19 | - | - | - | - | - | - | - | - | 1 | - | 1 | - |
| 8-19 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 9-19 | - | - | 1 | - | - | - | - | - | - | - | 1 | - |
| 10-19 | 5 | 5/1 | - | - | - | - | 2 | - | 2 | - | 9 | 5/1 |
| 11-19 | - | - | - | - | - | - | 2 | - | - | - | 2 | - |
| 13-19 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 24-19 | - | - | - | - | - | - | - | - | 1 | - | 1 | - |
| 25-19 | 2 | - | - | - | - | - | - | - | - | - | 2 | - |
| 2-20 | 1 | - | - | - | - | - | 1 | - | 1 | - | 3 | - |
| 3-20 | 1 | - | - | - | 1 | - | 1 | - | 1 | - | 4 | - |
| 6-20 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 10-20 | - | - | - | - | 1 | - | - | - | 1 | - | 2 | - |
| 3-21 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 4-21 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 6-21 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 7-21 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 8-21 | - | - | 1 | - | - | - | - | - | - | - | 1 | - |
| 12-21 | 3 | - | 1 | - | 1 | - | 3 | - | - | - | 8 | - |
| 14-21 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 5-22 | - | - | 1 | - | - | - | - | - | 1 | - | 2 | - |
| 8-22 | 1 | - | 1 | - | - | - | - | - | - | - | 2 | - |
| 9-22 | - | - | - | - | - | - | 2 | - | 1 | - | 3 | - |
| 10-22 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 11-22 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 12-22 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 5-23 | - | - | 1 | - | 1 | - | - | - | - | - | 2 | - |
| 7-23 | - | - | - | - | 1 | - | 1 | - | 1 | - | 3 | - |
| 8-23 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 12-23 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 4-24 | 1 | - | - | - | 1 | - | 1 | - | - | - | 3 | - |
| 5-24 | - | - | 1 | - | 1 | - | 1 | - | - | - | 3 | - |
| 7-24 | 1 | - | - | - | - | - | - | - | 1 | - | 2 | - |
| 8-24 | 2 | - | - | - | 1 | - | 1 | - | 1 | - | 5 | - |
| 9-24 | - | - | - | - | 1 | - | 1 | - | 1 | - | 3 | - |
| 10-24 | - | - | 1 | - | - | - | - | - | - | - | 1 | - |
| 11-24 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 17-24 | - | - | - | - | 1 | - | - | - | - | - | 1 | - |
| 18-24 | - | - | - | - | - | - | 1 | - | - | - | 1 | - |
| 2-25 | - | - | - | - | - | - | - | - | 2 | - | 2 | - |
| 4-25 | 3 | - | 1 | - | 6 | 6/2 | 7 | 5/3 | 2 | 0/1 | 19 | 11/6 |
| 5-25 | 2 | - | - | - | - | - | - | - | - | - | 2 | - |
| 6-25 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 7-25 | 1 | 0/1 | - | - | 2 | - | 1 | - | 1 | - | 5 | 0/1 |
| 8-25 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 9-25 | - | - | - | - | 2 | - | - | - | - | - | 2 | - |
| 11-25 | - | - | 1 | - | - | - | - | - | - | - | 1 | - |
| 12-25 | - | - | 2 | - | - | - | - | - | - | - | 2 | - |
| 13-25 | - | - | 1 | - | - | - | - | - | - | - | 1 | - |
| 2-26 | - | - | - | - | - | - | - | - | 1 | 6/1 | 1 | 6/1 |
| 3-26 | 2 | - | - | - | 1 | - | - | - | - | - | 3 | - |
| 4-26 | 2 | - | 1 | - | 2 | 4/1 | 2 | - | 1 | - | 8 | 4/1 |
| 5-26 | 5 | - | 6 | 14/2 | 5 | 11/2 | 9 | 17/4 | 5 | 23/4 | 30 | 65/12 |
| 6-26 | 6 | - | 4 | - | 8 | 17/4 | 3 | 0/1 | 5 | 2/2 | 26 | 19/7 |
| 7-26 | 6 | - | - | - | 4 | 12/2 | 3 | 5/1 | 4 | - | 17 | 17/3 |
| 8-26 | - | - | 4 | - | - | - | 1 | - | 4 | - | 9 | - |
| 9-26 | 1 | 0/1 | - | - | - | - | 1 | - | - | - | 2 | 0/1 |

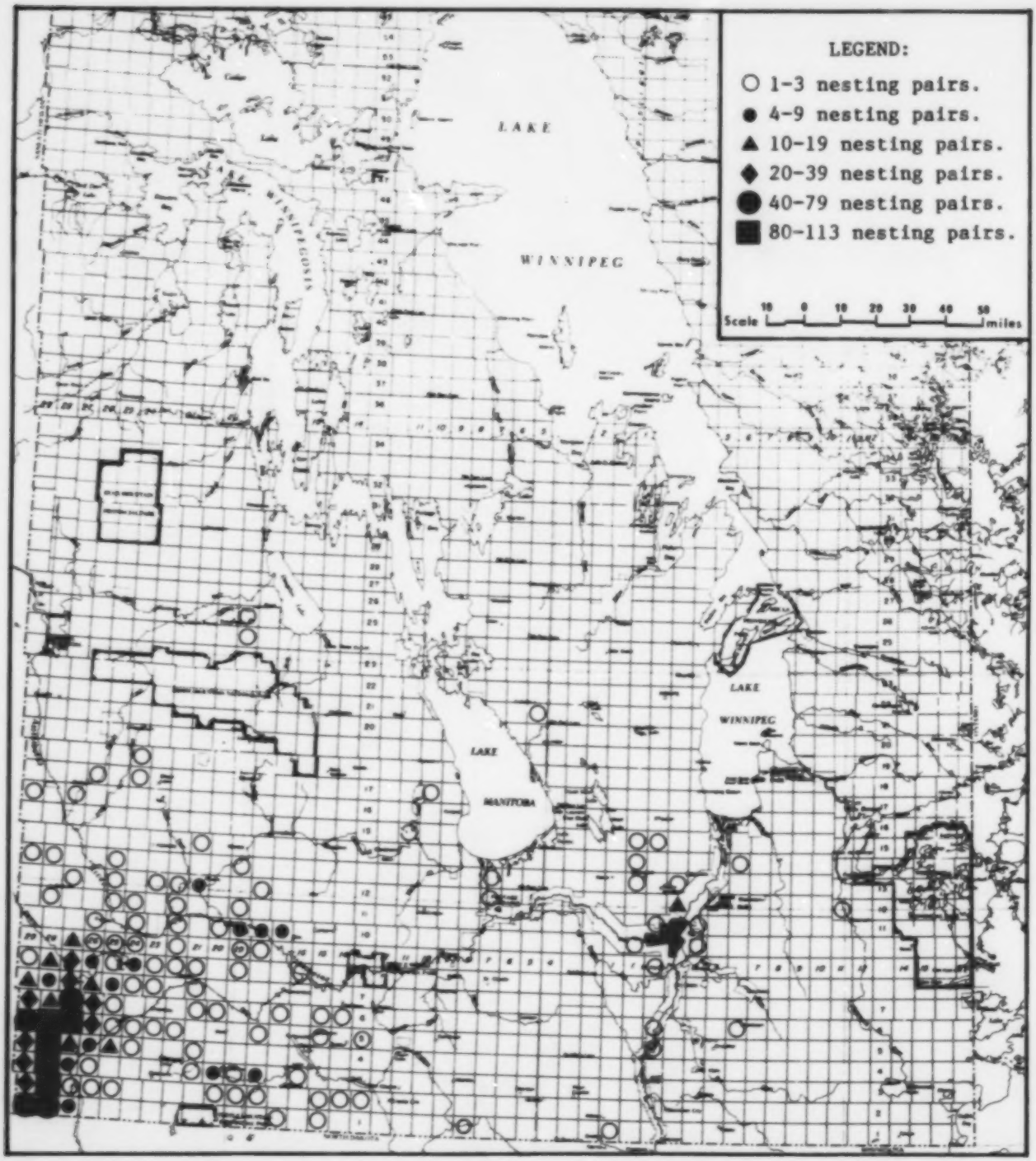
| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 10-26 | - | - | 1 | - | - | - | - | - | - | - | 1 | - |
| 17-26 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 1-27 | 1 | - | - | - | 2 | - | 1 | 6/1 | 2 | 0/1 | 6 | 6/2 |
| 2-27 | - | - | 1 | - | - | - | 1 | - | - | - | 2 | - |
| 3-27 | 2 | 4/2 | - | - | 1 | 0/1 | 2 | 7/1 | 2 | - | 7 | 11/4 |
| 4-27 | 9 | 0/1 | 2 | 5/1 | 2 | - | 2 | - | 2 | - | 17 | 5/2 |
| 5-27 | 22 | 16/6 | 18 | 11/4 | 17 | 16/4 | 17 | 27/8 | 9 | 21/5 | 83 | 91/27 |
| 6-27 | 4 | - | 5 | 0/1 | 12 | 6/1 | 11 | 16/5 | 9 | 13/2 | 41 | 35/9 |
| 7-27 | 12 | - | 6 | 6/1 | 8 | - | 3 | - | 3 | - | 32 | 6/1 |
| 8-27 | 8 | - | 4 | - | 8 | - | 1 | - | 2 | - | 23 | - |
| 9-27 | 2 | - | 1 | - | 3 | - | 1 | - | 4 | - | 11 | - |
| 12-27 | 1 | 0/1 | - | - | - | - | - | - | - | - | 1 | 0/1 |
| 16-27 | 1 | - | 1 | - | - | - | - | - | - | - | 2 | - |
| 1-28 | 19 | 4/1 | 18 | 6/5 | 9 | 11/2 | 13 | 20/5 | 16 | 31/6 | 75 | 72/19 |
| 2-28 | 15 | - | 21 | 5/2 | 19 | 7/1 | 29 | 57/16 | 29 | 76/16 | 113 | 145/35 |
| 3-28 | 16 | - | 19 | 13/4 | 18 | 0/1 | 12 | 20/6 | 15 | 51/9 | 80 | 84/20 |
| 4-28 | 27 | 16/5 | 20 | 35/9 | 12 | 3/2 | 19 | 19/4 | 26 | 50/16 | 104 | 123/36 |
| 5-28 | 19 | 5/3 | 21 | 3/4 | 19 | 26/6 | 18 | 9/4 | 13 | 15/6 | 90 | 58/23 |
| 6-28 | 1 | - | 2 | - | 2 | - | 8 | 0/1 | 5 | 0/1 | 18 | 0/2 |
| 7-28 | 1 | - | 2 | - | 2 | 7/1 | 1 | - | 3 | - | 9 | 7/1 |
| 8-28 | 1 | - | 2 | - | 9 | 5/1 | 4 | 13/2 | - | - | 16 | 18/3 |
| 11-28 | - | - | - | - | - | - | - | - | 1 | - | 1 | - |
| 13-28 | 2 | - | - | - | - | - | - | - | - | - | 2 | - |
| 1-29 | 13 | 4/2 | 9 | 4/1 | 7 | 0/1 | 7 | 18/5 | 6 | 15/5 | 42 | 41/14 |
| 2-29 | 7 | - | 9 | - | 8 | 13/2 | 6 | 20/3 | 6 | 12/7 | 36 | 45/12 |
| 3-29 | 3 | - | 2 | - | 5 | 0/1 | 10 | 5/2 | 10 | 23/5 | 30 | 28/8 |
| 4-29 | 3 | - | 8 | 1/3 | 3 | 7/1 | 5 | 2/3 | 4 | 18/5 | 23 | 28/12 |
| 5-29 | - | - | 20 | 8/2 | 18 | 22/5 | 21 | 35/9 | 16 | 19/8 | 75 | 84/24 |
| 6-29 | 3 | - | 1 | - | 10 | - | 6 | 11/3 | 4 | - | 24 | 11/3 |
| 7-29 | 5 | - | 1 | - | 4 | - | 2 | 6/1 | 3 | - | 15 | 6/1 |
| 8-29 | 1 | - | - | - | - | - | - | - | - | - | 1 | - |
| 13-29 | 2 | - | - | - | - | - | - | - | - | - | 2 | - |
| 16-29 | - | - | 2 | - | - | - | - | - | - | - | 2 | - |
| **TOTALS:** | **265** | | **232** | | **261** | | **270** | | **246** | | **1274** | |
| | **54/24** | | **111/39** | | **179/42** | | **324/90** | | **386/103** | | **1054/298** | |
| **AVERAGE Y/N:** | **(2.3)** | | **(2.8)** | | **(4.3)** | | **(3.6)** | | **(3.8)** | | **(3.54)** | |

The 1987-1991 distribution of Loggerhead Shrikes in Manitoba is indicated in Figure 4. As in previous years, the majority (89%) of Loggerhead Shrike sightings during 1991 occurred in the 40 townships south and west of Oak-Plum Lakes (Appendix VIII). Seven contiguous townships in the extreme southwest (1-29, 1-28 to 5-28, and 5-27) supported nearly half of Manitoba's known population. Improved coverage of the shelterbelt-dominated townships (1-28 and 2-28) and the grassland-dominated Poverty Plains (3-28 and 4-28) has resulted in slight increases in these four townships (86 in 1991 compared with 58-78 during previous years). A 160-km (100-mile) route was created and censused in each of these two areas during mid-June, yielding totals of 25 pairs and 15 pairs, respectively. These routes will be surveyed at periodic intervals to assess population fluctuations.

3.4.2) Nest success\Productivity

Increased numbers of nests found and more young banded (Table 5) are also a reflection of increased survey efforts and refined survey techniques. Of 161 nests found during 1991, 105 contained eggs when they were found, 6 contained viable eggs and young, 37 had young (some also had inviable eggs), 12 had fledged young nearby, and 1 had failed (Appendix VIII). Egg-laying commenced in mid-May; clutches of 3 eggs, 2 eggs and three 1-egg clutches were found on 16 May. Clutch size ranged from 4-7 eggs (X=6.3) in 86 clutches known or believed to be complete. Young were first noted on 5 June. Among 103 nests monitored from the egg stage to fledging, 75 (73%) were successful producing 386 young (Table 5). This represents an average fledging success of 3.7 young/initiated nest. Although the average brood size (5.1) was slightly lower than 1987-1991 averages (Table 5), the average number of young/initiated nest was higher due to superior nesting success during 1991. Rain, wind and cool weather contributed to several partial and complete brood losses after mid-June. Although these losses were not as prevalent as in 1989 and 1990, they were again prominent in open-willow nests within the Poverty Plains region. Exposure to the elements resulted in higher losses and lower productivity during 1991 for 25 nests in the Poverty Plains (X=4.0) than for 22 nests in the Lyleton

Figure 4. Distribution of Loggerhead Shrikes in Manitoba during 1987-1991 based on the total number of nesting pairs or territorial adults per township.



shelterbelts (X=4.9). This same trend was evident during 1989 and 1990 (De Smet and Conrad 1990, De Smet 1991), and is believed to be the main reason why populations are undergoing localized increases in the shelterbelt-dominated townships and apparent declines in the extensive grassland-dominated townships. During 1987 and 1988, when rainy weather was not a factor, trends in productivity and nesting densities in these two areas were reversed (De Smet and Conrad 1991).

3.4.3) Banding\Return rates

A total of 610 juvenile and 37 adult shrikes were banded during 1991, bringing the total number of shrikes banded since 1987 to 1998 juveniles and 42 adults (Table 5). Juveniles were banded with a USFWS aluminum band on the left leg and a red/white plastic band on the right. Twenty-one juveniles banded in and around Winnipeg were banded white/red plastic over aluminum on left and white/red plastic on right (these are believed to belong to the endangered L. l. migrans subspecies). Adults were banded red/white plastic over aluminum on left and white plastic on right.

Of 308 adults checked for bands, 11 (3.6%) were previously banded. All had been banded as juveniles in Manitoba, including 5 from 1990, 5 from 1989 and 1 from 1988. Eight had retained the red/white plastic bands; two of the 1989 juveniles and the lone 1988 juvenile retained only the aluminum band. Six of these were successful including the 1988 juvenile, four from 1989, and a juvenile female from 1990. Band numbers were read on seven of the returning juveniles. The 1988 juvenile (unsexed) nested 27.2 km S of its natal site, 1989 females nested 12.8 km N and 63.4 km S of their natal sites, 1989 males nested 3.6 km NW, 12.0 km N and 78.4 km NE (moved from Pipestone to Brandon) of their natal sites, and the 1990 female nested 33.0 km S of its natal site. None of the eight banded adults from 1990 were found (all had originally been banded as juveniles and four had been successful during 1990)!

3.5 Baird's Sparrow and other ground-nesting passerines

3.5.1) Status\Distribution

Baird's Sparrows arrived in southwest Manitoba during the second week

in May 1991; singing males were first noted on 10 May. A total of 270 singing males were recorded at 119 sites (Appendix IX). For comparison purposes, Chestnut-collared Longspurs were found at 281 sites, Sprague's Pipits at 149 sites and Grasshopper Sparrows at 79 localities. The 1987-1991 distribution of Baird's Sparrows in Manitoba is shown in Figure 5. The breeding range and total numbers of Baird's Sparrows in southern Manitoba has been declining since 1988 when 460 adults were found at 264 sites (Table 7). During 1991, Baird's Sparrows were recorded north and east to Rivers (11-22) and Boissevain (2-21). Spot-mapping revealed nesting densities of Baird's Sparrows in the hayed and pastured study plots of 24 and 31 singing males (30 and 39 males/40 hectares, respectively) (Davis in prep.). Baird's densities at these two sites are among the highest in southwestern Manitoba. An indication of the relative density of Baird's Sparrows in the Shilo military ranges (ideal mixed-grass prairie southeast of Brandon) was provided by transect surveys conducted by G.Holland (in prep.). A total of 100 stops were made along each of seven transects; each transect was censused on four occasions from 21 May to 24 June, 1991. Baird's Sparrows were recorded at only 4% of the stops. By comparison, Chestnut-collared Longspurs were noted at 11%, Grasshopper Sparrows at 27%, and Sprague's Pipits at 32% of the stops!

3.5.2) Habitat preferences

Habitat was categorized at all sites where Baird's Sparrows were found during 1991; 55% of these were in pastureland, 31% were in haylands (including 13% in brome/alfalfa haylands), 4% were in cropland (usually stubble fields or weedy low areas) and 9% were in idle areas (these were often hard to distinguish from haylands, hence use of idle areas was probably under-represented) (Appendix IX). Percentages for 1990 were similar, with slightly greater use of pastureland and less were in idle areas (De Smet 1991). Grasshopper Sparrows were less frequent in pastureland (45%), were more regular in idle areas (19%), and occupied haylands (29%) and cropland (6%) in similar percentages as Baird's (Appendix IX). Sprague's Pipits were generally found in pastureland (63%) and haylands (30%, including only 6% in

Figure 5. Distribution of Baird's Sparrows in Manitoba during 1987-1991 based on the total number of breeding sites per township.

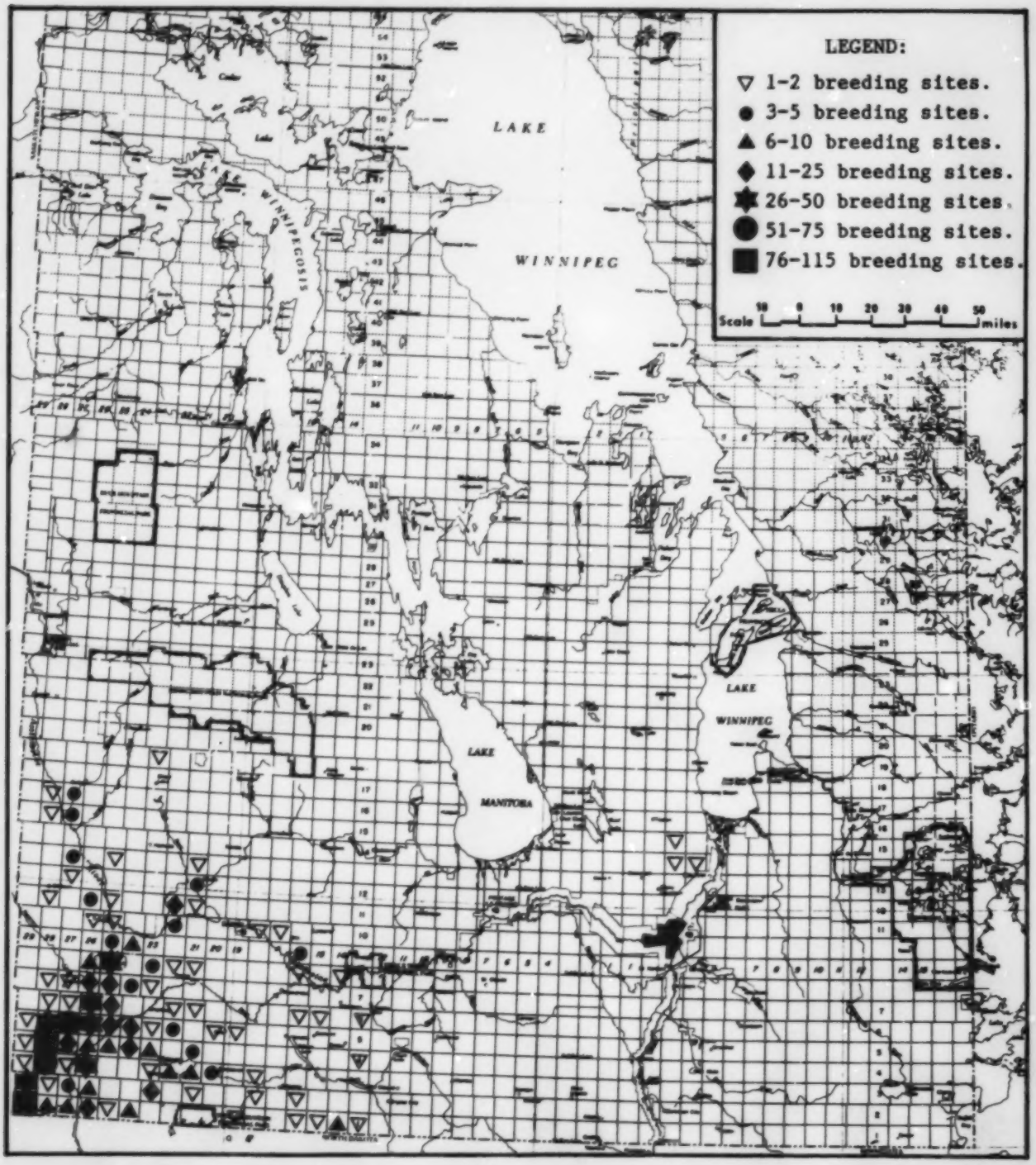


Table 7. Baird's Sparrow nesting and banding data in Manitoba, 1987-1991 (from unpublished data, De Smet and Conrad 1989c, 1990; De Smet 1991, present study).

| | 1987 | 1988 | 1989 | 1990 | 1991 | Totals (1987-91) |
|---|---|---|---|---|---|---|
| No. sites | 148 | 264 | 218 | 164 | 119 | 913 |
| No. singing adults | 225 | 460 | 321 | 280 | 270 | 1556 |
| No. nests found | 0 | 13 | 4 | 14 | 37 | 68 |
| No. complete clutches[1] | - | 7 | 4 | 8 | 23 | 42 |
| Average clutch size | - | 3.9 | 3.8 | 3.5 | 4.5 | 4.12 |
| No. nests monitored[2] | - | 8 | 0 | 5 | 27 | 40 |
| % successful[3] | - | 63 | - | 40 | 37 | 42.5 |
| No. young fledged[4] | - | 14 | - | 7 | 31 | 52 |
| Average brood size | - | 2.8 | - | 3.5 | 3.1 | 3.06 |
| Average young/nest | - | 1.8 | - | 1.4 | 1.1 | 1.30 |
| % total nests parasitized | - | 15 | 0 | 0 | 24 | 16.2 |
| % multiply parasitized | - | 15 | 0 | 0 | 19 | 13.2 |
| No. cowbirds fledged | - | 3 | 0 | 0 | 5 | 8 |
| No. young banded | 0 | 25 | 0 | 22 | 53 | 100 |
| No. adults banded | 0 | 9 | 0 | 0 | 8 | 17 |

[1] Nests with cowbird eggs not included.

[2] only nests initially found with eggs included.

[3] Nests that fledged at least one host young.

[4] Determined at banding age or approximately 6-days old (occasionally losses were observed after this date and included).

brome/alfalfa); 7% were in idle areas and none were in cropland. Chestnut-collared Longspurs were virtually restricted to pastureland (94%), with only 4% observed in haylands (including 1% in brome/alfalfa), 2% in idle areas and none in cropland.

3.5.3) Laying dates\Clutch sizes\Nest success\Productivity

A total of 139 nests of ground-nesting passerines were found during 1991. These included 37 Baird's Sparrow, 30 Grasshopper Sparrow, 25 Chestnut-collared Longspur, 19 Western Meadowlark, 17 Savannah Sparrow and 11 Sprague's Pipit nests. Baird's Sparrows initiated egg-laying in late May and early June; five complete clutches were found on 7 June and one clutch was found hatching on 10 June. Two other Baird's clutches were still being incubated on 9 August. Grasshopper Sparrows and Savannah Sparrows probably started nesting slightly earlier than Baird's Sparrows; nests with multiple young were found on 10 June. Other ground-nesting passerines initiated nesting much earlier; Chestnut-collared Longspur, Sprague's Pipit and Western Meadowlark all had complete clutches by 22 May and young by 3 June.

Of the 37 Baird's nests, 14 were successful, 16 were depredated, two failed due to exposure to inclement weather, two fledged only Brown-headed Cowbird (Molothrus ater) young, one was stepped on by cattle, one was deserted for unknown reasons, and the outcome of one nest was unknown (Davis in prep.). A total of 41 host young were fledged (2.9/successful nest or 1.1/initiated nest). Nine of the Baird's nests were parasitized by cowbirds, including seven that were multiply parasitized (contained more than one cowbird egg or young). Five cowbird young were fledged (two of these were from nests that also fledged Baird's young).

Nesting data for Baird's Sparrows and other ground-nesting passerines from 1987-1991 is presented in Tables 7 and 8. Complete clutch sizes for non-parasitized Baird's Sparrow nests averaged 4.1 eggs, ranging from 4.7 eggs for 10 nests initiated in June to 3.9 for 32 July-August clutches. Forty Baird's nests were found at the egg stage and followed to fledging. Of these, 17 (42.5%) were successful, fledging 52 young

(3.1/successful nest or 1.3/initiated nest). Sixteen percent of the 68 Baird's nests that have been found since 1987 were parasitized by cowbirds; 13% were multiply parasitized (Table 7).

Complete clutch sizes for non-parasitized nests of other ground-nesting passerines (Table 8) were larger than those witnessed for Baird's Sparrows. Early (June) nests were invariably larger than late nests (July-August). Savannah Sparrow clutches averaged 4.2 eggs, and ranged from 5.0 for early (n=4) to 3.7 for late (n=7) nests. Grasshopper Sparrow clutches averaged 4.4 eggs, ranging from 4.8 eggs for early (n=4) to 4.3 eggs for late (n=15) nests. Chestnut-collared Longspur clutches averaged 4.6 eggs, ranging from 4.9 for early (n=14) to 3.8 for late (n=4) nests. Sprague's Pipit clutches averaged 4.8 eggs, ranging from 5.8 for early (n=4) to 4.3 for late (n=8) nests. Western Meadowlark clutches also averaged 4.8 eggs, ranging from 5.0 for early (n=6) to 4.3 for late (n=3) nests.

Nesting success and overall productivity of ground-nesting passerines from 1987-1991 (Table 8) was generally higher than the 43% nest success and 1.3 young/initiated nest observed for Baird's Sparrows. Only Grasshopper Sparrows, with 25% nest success and 0.9 young/nest (n=24), experienced lower success. Western Meadowlarks had a 44% nest success and fledged 1.4/nest (n=16). Half of the 14 Savannah Sparrow nests were successful fledging an average 1.3 young/nest. Chestnut-collared Longspurs had slightly better nest success (52%) and productivity (1.9;n=21). Sprague's Pipits experienced the highest nest success (64%) and productivity (2.1; n=14).

Cowbird parasitism rates on most ground-nesting bird nests were slightly higher than the 16% rate observed for Baird's Sparrow nests. Thirty-four of 134 nests (25%) of other ground-nesting birds were parasitized from 1987-1991 (Table 8). Parasitism rates were lowest for Chestnut-collared Longspurs (12%) and Sprague's Pipits (15%), moderate for Savannah Sparrows (21%) and Grasshopper Sparrows (30%), and high for Western Meadowlark nests (46%).

3.5.4) Banding data

During 1991, 53 juvenile Baird's Sparrows were banded with red/white

Table 8. Nesting data for other ground-nesting birds in Manitoba, 1987-1991 (from unpublished data; De Smet and Conrad 1989c, 1990; De Smet 1991, present study).

| | 1987 | 1988 | 1989 | 1990 | 1991 | Totals (1987-91) |
|---|---|---|---|---|---|---|
| **Grasshopper Sparrow** | | | | | | |
| No. sites | 21 | 120 | 98 | 66 | 79 | 384 |
| No. nests found | 0 | 5 | 0 | 5 | 30 | 40 |
| No. complete clutches | - | 1 | - | 0 | 18 | 19 |
| Average clutch size | - | 4.0 | - | - | 4.4 | 4.42 |
| No. nests monitored | - | 2 | - | 0 | 22 | 24 |
| % successful | - | 50 | - | - | 23 | 25.0 |
| Average brood size | - | 2.0 | - | - | 3.8 | 3.50 |
| Average young/nest | - | 1.0 | - | - | 0.9 | 0.88 |
| % parasitized | - | 60 | - | 20 | 27 | 30.0 |
| **Sprague's Pipit** | | | | | | |
| No. sites | 148 | 191 | 232 | 173 | 149 | 893 |
| No. nests found | 1 | 6 | 0 | 2 | 11 | 20 |
| No. complete clutches | 0 | 5 | - | 1 | 6 | 12 |
| Average clutch size | - | 4.4 | - | 4.0 | 5.2 | 4.75 |
| No. nests monitored | 0 | 5 | - | 1 | 8 | 14 |
| % successful | - | 80 | - | 100 | 50 | 64.3 |
| Average brood size | - | 3.5 | - | 3.0 | 3.3 | 3.33 |
| Average young/nest | - | 2.8 | - | 3.0 | 1.6 | 2.14 |
| % parasitized | 0 | 17 | - | 0 | 18 | 15.0 |
| **Chestnut-collared Longspur** | | | | | | |
| No. sites | 100 | 180 | 273 | 260 | 281 | 1094 |
| No. nests found | 1 | 0 | 0 | 0 | 25 | 26 |
| No. complete clutches | 0 | - | - | - | 18 | 18 |
| Average clutch size | - | - | - | - | 4.6 | 4.61 |
| No. nests monitored | 0 | - | - | - | 21 | 21 |
| % successful | - | - | - | - | 52 | 52.4 |
| Average brood size | - | - | - | - | 3.5 | 3.55 |
| Average young/nest | - | - | - | - | 1.9 | 1.86 |
| % parasitized | 0 | - | - | - | 12 | 11.5 |
| **Savannah Sparrow** | | | | | | |
| No. nests found | 0 | 3 | 0 | 4 | 17 | 24 |
| Average complete clutch size | - | - | - | 4.0(2) | 4.2(9) | 4.18 |
| % nests successful | - | - | - | 100(1) | 46(13) | 50.0 |
| Average young/nest | - | - | - | 3.0 | 1.2 | 1.29 |
| % parasitized | - | 0 | - | 0 | 29 | 20.8 |
| **Western Meadowlark** | | | | | | |
| No. nests found | 1 | 3 | 0 | 1 | 19 | 24 |
| Average complete clutch size | - | - | - | - | 4.8(9) | 4.78 |
| % nests successful | - | - | - | - | 44(16) | 43.8 |
| Average young/nest | - | - | - | - | 1.4 | 1.38 |
| % parasitized | 0 | 67 | - | 0 | 47 | 45.8 |

plastic over USFWS aluminum on the left leg. Twelve of these young were from unknown nests (caught during nest drags); the remaining 41 were from 14 successful nests. Eight adult females were banded red/white plastic on right and aluminum on left. Since 1987, 100 juveniles and 17 adult Baird's Sparrows have been banded in southwestern Manitoba (Table 7).

3.6 Other conservation, management and extension efforts

Additional conservation, management and extension services conducted during 1991 included:

- Departmental staff responded to numerous requests on endangered grassland birds from the media, schools, conservation groups, consultant agencies and the general public. Newspaper articles, radio and television programs, and public presentations highlighted the plight of native grassland birds and management initiatives in Manitoba.
- An Operation Lifeline (World Wildlife Fund Canada) tour of the prairies of southwestern Manitoba was offered for the second consecutive year. Several local interest groups were escorted through the study area to highlight the significance of this area and the need for additional protection of grassland ecosystems.
- Displays on Manitoba's endangered species were exhibited at National Wildlife Week in Winnipeg and at the Brandon Winter Fair.
- A prairie-wide brochure on the Burrowing Owl is being prepared in conjunction with Saskatchewan and Alberta wildlife staff.
- Landowners in southwestern Manitoba have gained a new appreciation for the plight of indigenous grassland birds through continuing field efforts in their area, involvement of local enthusiasts, handouts provided to landowners and interested individuals, and special interest articles in local newspapers.
- After several years of ground-truthing grasslands in the southwest, lists of priority habitats and critical sites for Burrowing Owls and Ferruginous Hawks have been prepared (see Appendix V and Section 3.1). These lists will assist other programs such as the Critical

Wildlife Habitat Program which is preparing mixed-grass prairie inventories for southern Manitoba and priority lists of prairie sites for acquisition and leasing.

- An additional 2366 acres of mixed-grass prairie was leased or voluntarily protected in southwestern Manitoba during 1991 (including critical areas for Burrowing Owls, Ferruginous Hawks, Loggerhead Shrikes and/or Baird's Sparrows) through the Critical Wildlife Habitat Program (Conrad 1991).
- Departmental staff are involved in the preparation of National Recovery Plans for the Burrowing Owl, Ferruginous Hawk, Loggerhead Shrike and Baird's Sparrow.
- In July 1991, municipal offices throughout southwestern Manitoba were contacted regarding plans for grasshopper spraying and were advised on sites and chemicals to avoid. At least one municipality that had plans on using Furadan was persuaded to use a less hazardous chemical. Landowners who had Burrowing Owls on their property were also advised to avoid spraying near active burrows and were provided with a Chemagro package outlining special precautions regarding the use of Furadan.
- The involvement of the North Dakota Game and Fish Department in status assessments and reintroductions of Burrowing Owls has created interest among North Dakota staff in expanding Burrowing Owl monitoring efforts in the state.
- Employment of post-secondary students has spurred renewed interest in grasslands research. One of these students plans on conducting a University of Manitoba Master's degree study in southwestern Manitoba focusing on grasslands passerines/cowbird interactions (with emphasis on how this affects Baird's Sparrow productivity). A second student will be conducting a practicum at the Natural Resources Institute, University of Manitoba, on aspects of Loggerhead Shrike nesting ecology and management concerns.

## 4.0 SUMMARY

Monitoring and management of Manitoba's threatened and endangered grassland birds continued in 1991. Surveys were concentrated in the southwest corner of the province where most of the remaining populations occur. Twenty key nesting areas for Ferruginous Hawks were identified, including 70 townships that were extensively searched for nesting Ferruginous during April. Sixteen key nesting areas for Burrowing Owls were identified, including 46 townships that were extensively surveyed during May and early June. A list of 713 priority sites was prepared identifying "very good", "good" and "fair" Burrowing Owl habitat in southern Manitoba.

A total of 48 nesting Ferruginous Hawk pairs were located in 1991, representing the first time populations have declined since monitoring began in 1987. Including observations from a network of observers, Ferruginous Hawks were seen or reported in 27 other locations. Population declines were apparent in almost all nesting areas, but were especially evident near the periphery of their nesting range. Most pairs (35) nested in or near former nest sites; 13 pairs were in new nesting locals. Twelve pairs (one-quarter of the nesting population) used nest structures or modified nests. Fifty-eight additional nest structures were erected; since 1987, 191 structures have been erected. Nesting success (60%) was slightly higher than the 56% long-term average. Few large broods were found, but there were also few small broods. At least 78 young fledged (2.7/successful nest or 1.7/initiated nest); both of these were below long-term averages. Seventy-six juveniles were banded, bringing the five-year total to 270. Of 40 adults checked for bands, only one was banded.

Ideal weather during May and June 1991 allowed for increased survey coverage of potential Burrowing Owl nesting areas. Nevertheless, the 23 nesting pairs and 10 singles that were found was not an appreciable difference from 1990 totals and was down from 1988 and 1989 totals. Burrowing Owls were observed north to Brandon and east to Snowflake -- an eastern range extension. Over two-thirds, however, were found in the extreme southwest. More than half (58%) of the 1990 nesting sites were reoccupied. This was higher than the 39%

reoccupancy rate observed since 1987. Pairs that were successful during the previous year were found to be much more likely to return than failed pairs. Scanning of suitable but traditionally unoccupied grasslands yielded a majority of the 1991 records; others were reported by local landowners and interested naturalists. One pair successfully nested in an artificial nesting burrow -- the first time this has been observed in Manitoba.

Only 61% of the Burrowing Owl pairs during 1991 were successful, lower than the 75% success rate observed from 1987-1991. Predators, vehicular collisions and grasshopper spraying were suspected to have contributed to adult mortality and nesting losses. Larger broods contributed to more young/brood at banding age during 1991 (6.3) than in 1987-1991 combined (5.5). Eighty-one young and 8 adults were banded, bringing the five-year totals to 417 young and 54 adults. More than one-third of the nesting adults were previously banded, including 10 that were originally banded as juveniles (seven of these were from 1990, representing a minimum 5% return of juveniles). Returning juveniles were found 2-26 km from natal sites. Two adults moved up to 32 km from where they had previously nested; all other previously-banded adults returned to former nesting sites. Less than one-third of the banded adults from 1990 returned during 1991 -- similar to return rates from 1989 to 1990. Although some of the missing owls may have moved to alternate sites, elevated rates of adult mortality are evident and are suspected to be paramount in recent declines of the species in Manitoba.

A reintroduction program was continued to counteract current Burrowing Owl declines in Manitoba. Surveys conducted in prairie dog colonies in southwestern North Dakota revealed adequate populations; 50 juveniles from North Dakota were transferred to holding pens near Broomhill, Manitoba, and were released after a period of familiarization. Prior to this year, 129 juveniles and 18 adult Burrowing Owls have been reintroduced in southern Manitoba. At least one juvenile from the 1990 release at Broomhill returned and nested 6 km from the reintroduction site -- the first known instance of a released Burrowing Owl returning to Manitoba.

Loggerhead Shrike surveys revealed a total of 246 pairs, down 9% from the 1990 total. Nearly half of the 1991 sightings were in seven contiguous

grassland and shelterbelt-dominated townships in the extreme southwest and 89% were in 40 townships south and west of Oak-Plum Lakes. Declines were most evident in the northern half of the latter block, where known populations have declined 33% since 1989. Special survey routes were designed to assess long-term population fluctuations in two major concentration sites in the southwest. A total of 161 shrike nests were found; clutch size averaged 6.3 in 86 complete clutches. Since 1987, 585 shrike nests have been found in southern Manitoba; 251 complete clutches have averaged 6.2 eggs. Nearly three-quarters of the 1991 shrike nests were successful, producing an average 5.1 young/successful nest or 3.7/initiated nest. Rain, wind and cool weather contributed to reduced nesting success in open-willow nests within extensive grassland-dominated townships. A total of 610 juveniles and 37 adults were banded, bringing the five-year total to 1998 juveniles and 42 adults. Nearly 4% of the adults had been previously banded as juveniles; these were found 4-63 km from their natal sites.

Baird's Sparrows were noted at 119 sites, down substantially from the 164 sites noted in 1990 and 264 sites from 1988. Most were in pastureland (55%) and haylands (31%); 9% were in idle areas and 5% were in stubble fields or weedy crops. A total of 139 ground-nesting passerine nests were found including 37 Baird's Sparrow, 30 Grasshopper Sparrow, 25 Chestnut-collared Longspur, 19 Western Meadowlark, 17 Savannah Sparrow and 11 Sprague's Pipit nests. Fourteen of the Baird's nests were successful fledging 41 host young (1.1/initiated nest) and 2 cowbird young. Nine Baird's nests were parasitized by Brown-headed Cowbirds including two that fledged only cowbird young. Data for 68 Baird's Sparrow nests and 134 other ground-nesting bird nests from 1987-1991 were compared. Complete clutch sizes ranged from 4.1 for Baird's Sparrows to 4.8 for Sprague's Pipits and Western Meadowlarks. Averages for June-initiated clutches were 0.5 to 1.7 eggs larger than for clutches initiated in July or August. Nest success (percentage of nests found with eggs that fledged at least one host young) and productivity (young/initiated nest) ranged from 25% and 0.9 young for Grasshopper Sparrows to 64% and 2.1 young for Sprague's Pipit. Baird's Sparrows experienced intermediate nesting success (43%) and productivity (1.3 young/nest). Sixteen percent of the

Baird's nests were parasitized by cowbirds, including 13% that were multiply parasitized. Twenty-five percent of the other ground-nesting passerine nests were parasitized; frequencies ranged from 12% for Grasshopper Sparrows and 15% for Sprague's Pipits to 30% for Grasshopper Sparrows and 46% for Western Meadowlarks. Fifty-three juvenile and 8 adult Baird's Sparrows were banded during 1991, bringing the five-year total to 100 juveniles and 17 adults.

Other conservation, management and extension efforts for threatened and endangered grassland birds included:

- consultation with interest groups and the media;
- preparation and distribution of information brochures and handouts;
- displays at wildlife shows and exhibitions;
- tours of the grassland study area;
- identification of priority areas for acquisition or leasing;
- protection of critical mixed-grass prairie sites in the southwest;
- preparation of national recovery strategies;
- consultation with municipalities regarding grasshopper spraying; and
- involving other agencies (i.e., North Dakota Game and Fish) and post-secondary students in recovery efforts.

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# APPENDICES

APPENDIX I. Survey effort based on total time (minutes) spent in each township from mid-April through mid-June, and time spent in infrequently visited townships after mid-June, 1991.

| Township | April 16-30 | May 1-15 | May 16-31 | June 1-15 | mid-June to Aug. | Total minutes |
|---|---|---|---|---|---|---|
| 1-5 | - | - | - | 25 | - | 25 |
| 2-5 | - | - | - | 15 | - | 15 |
| 3-5 | - | - | - | 10 | - | 10 |
| 4-5 | - | - | - | 10 | - | 10 |
| 5-5 | - | - | - | 10 | - | 10 |
| 6-5 | - | - | - | 10 | - | 10 |
| 1-6 | - | - | - | 20 | - | 20 |
| 1-7 | - | - | - | 25 | - | 25 |
| 1-8 | - | - | - | 45 | - | 45 |
| 1-9 | - | - | - | 25 | - | 25 |
| 6-9 | - | - | - | - | 60 | 60 |
| 11-9 | - | 10 | - | - | - | 10 |
| 12-9 | - | 45 | - | - | - | 45 |
| 1-10 | - | - | 55 | 75 | - | 130 |
| 2-10 | - | - | 10 | - | - | 10 |
| 7-10 | - | - | - | - | 75 | 75 |
| 12-10 | - | 10 | - | - | - | 10 |
| 13-10 | - | 150 | - | - | - | 150 |
| 1-11 | - | - | - | 25 | - | 25 |
| 2-11 | - | - | 10 | - | - | 10 |
| 7-11 | - | - | - | - | 60 | 60 |
| 1-12 | - | - | - | 10 | - | 10 |
| 2-12 | - | - | 15 | - | - | 15 |
| 1-13 | - | - | - | 20 | - | 20 |
| 2-13 | - | 15 | 30 | - | - | 45 |
| 6-13 | 28 | - | - | 10 | - | 38 |
| 7-13 | 8 | - | - | - | - | 8 |
| 1-14 | - | - | - | 20 | - | 20 |
| 2-14 | - | - | 20 | - | - | 20 |
| 6-14 | 105 | - | - | 15 | 20 | 140 |
| 11-14 | 20 | - | - | - | - | 20 |
| 1-15 | - | - | - | 20 | 20 | 40 |
| 2-15 | 10 | - | 15 | - | - | 25 |
| 3-15 | 20 | - | - | - | - | 20 |
| 4-15 | 10 | - | - | - | - | 10 |
| 5-15 | 10 | - | - | - | - | 10 |
| 6-15 | 100 | - | - | 45 | 10 | 155 |
| 7-15 | - | - | 40 | - | - | 40 |
| 11-15 | 20 | - | - | - | - | 20 |
| 1-16 | 10 | - | - | - | 20 | 30 |
| 2-16 | 100 | 25 | 55 | - | - | 180 |
| 3-16 | 25 | 35 | - | - | - | 60 |
| 6-16 | 35 | - | - | 20 | 10 | 65 |
| 7-16 | 40 | - | 60 | - | - | 100 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 8-16 | 5 | - | - | - | - | 5 |
| 9-16 | 15 | - | - | - | - | 15 |
| 11-16 | 25 | - | - | - | - | 25 |
| 1-17 | - | - | - | - | 25 | 25 |
| 2-17 | 20 | - | 15 | - | - | 35 |
| 3-17 | - | - | 10 | - | - | 10 |
| 5-17 | - | - | 10 | - | - | 10 |
| 6-17 | 15 | - | 35 | - | 50 | 100 |
| 7-17 | - | - | 10 | - | 8 | 18 |
| 8-17 | 25 | - | - | - | - | 25 |
| 9-17 | 30 | - | - | - | - | 30 |
| 10-17 | 60 | - | - | - | - | 60 |
| 1-18 | - | - | - | - | 15 | 15 |
| 2-18 | 15 | 32 | - | - | - | 47 |
| 3-18 | 60 | - | 80 | - | - | 140 |
| 4-18 | - | - | 35 | - | - | 35 |
| 5-18 | - | - | 75 | - | - | 75 |
| 6-18 | - | - | 10 | - | - | 10 |
| 7-18 | - | - | 15 | - | 4 | 19 |
| 8-18 | - | - | 25 | - | 8 | 33 |
| 9-18 | 100 | - | 60 | - | 40 | 200 |
| 10-18 | 85 | - | - | - | - | 85 |
| 1-19 | - | - | - | - | - | 5 |
| 2-19 | - | 50 | - | - | - | 50 |
| 3-19 | 45 | - | 35 | - | - | 80 |
| 4-19 | - | - | 15 | - | - | 15 |
| 5-19 | - | - | - | - | 20 | 20 |
| 6-19 | - | - | - | - | 10 | 10 |
| 7-19 | - | - | 15 | - | - | 15 |
| 8-19 | - | - | 10 | - | - | 10 |
| 9-19 | 60 | - | 100 | - | - | 160 |
| 10-19 | 35 | - | - | 30 | 120 | 185 |
| 11-19 | 40 | - | - | - | 45 | 85 |
| 2-20 | - | 10 | - | - | 10 | 20 |
| 3-20 | 40 | - | 105 | - | - | 145 |
| 4-20 | - | - | 15 | - | - | 15 |
| 5-20 | - | - | - | - | 5 | 5 |
| 6-20 | 25 | - | - | - | - | 25 |
| 7-20 | 35 | - | 20 | - | - | 55 |
| 8-20 | 15 | - | - | - | 45 | 60 |
| 9-20 | - | - | 10 | - | - | 10 |
| 10-20 | 20 | 80 | 30 | 30 | 95 | 255 |
| 2-21 | - | 50 | - | - | 20 | 70 |
| 3-21 | 60 | - | 110 | - | - | 170 |
| 4-21 | - | - | 35 | - | 15 | 50 |
| 5-21 | - | - | - | - | 10 | 10 |
| 6-21 | 35 | - | - | - | - | 35 |
| 7-21 | - | 40 | 10 | - | - | 50 |
| 8-21 | - | 30 | - | - | 15 | 45 |
| 9-21 | - | - | 10 | - | - | 10 |
| 10-21 | 25 | 30 | - | 20 | 15 | 90 |
| 11-21 | - | - | - | - | 15 | 15 |
| 2-22 | - | 15 | - | - | 10 | 25 |
| 3-22 | 50 | - | 85 | - | - | 135 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 4-22 | 15 | 10 | 50 | - | - | 75 |
| 5-22 | 150 | 80 | 25 | - | - | 255 |
| 6-22 | 15 | 90 | 25 | - | - | 130 |
| 7-22 | - | 25 | - | - | - | 25 |
| 8-22 | - | 30 | - | - | - | 30 |
| 9-22 | - | - | - | 20 | 15 | 35 |
| 10-22 | 10 | - | - | 20 | 10 | 40 |
| 11-22 | 20 | - | - | - | 130 | 150 |
| 2-23 | - | 120 | - | - | 30 | 150 |
| 3-23 | 15 | 45 | 60 | - | - | 120 |
| 4-23 | 55 | 50 | 50 | - | - | 155 |
| 5-23 | 50 | 15 | - | - | - | 65 |
| 6-23 | - | 15 | - | - | - | 15 |
| 7-23 | 60 | 75 | 30 | - | - | 165 |
| 8-23 | - | 15 | - | - | - | 15 |
| 9-23 | - | - | - | 35 | 10 | 45 |
| 12-23 | 20 | - | - | - | - | 20 |
| 13-23 | 15 | - | - | - | - | 15 |
| 1-24 | - | - | - | - | 40 | 40 |
| 2-24 | - | 165 | - | - | - | 165 |
| 3-24 | - | 15 | 25 | - | - | 40 |
| 4-24 | 75 | 250 | 195 | - | - | 520 |
| 5-24 | 60 | 120 | 65 | - | - | 245 |
| 6-24 | - | 20 | 10 | - | - | 30 |
| 7-24 | 50 | 10 | 35 | - | - | 95 |
| 8-24 | 25 | 10 | - | - | 10 | 45 |
| 9-24 | 40 | - | - | 60 | 10 | 110 |
| 10-24 | 35 | - | - | - | - | 35 |
| 11-24 | 150 | - | - | - | - | 150 |
| 12-24 | 40 | - | - | - | - | 40 |
| 13-24 | 5 | - | - | - | - | 5 |
| 2-25 | - | 95 | - | - | - | 95 |
| 3-25 | - | 100 | 10 | - | - | 110 |
| 4-25 | 60 | 125 | 150 | - | - | 335 |
| 5-25 | 5 | 110 | 40 | - | - | 155 |
| 6-25 | 25 | 165 | - | - | - | 190 |
| 7-25 | 175 | 225 | 125 | - | - | 525 |
| 8-25 | 65 | 215 | 140 | - | - | 420 |
| 9-25 | - | - | - | 20 | - | 20 |
| 10-25 | 50 | - | - | - | - | 50 |
| 11-25 | 35 | - | - | - | - | 35 |
| 12-25 | 110 | - | - | - | - | 110 |
| 13-25 | 75 | - | - | - | - | 75 |
| 1-26 | 105 | (+) | 325 | - | - | 430(+) |
| 2-26 | 70 | (+) | 380 | - | - | 450(+) |
| 3-26 | 140 | (+) | 60 | 235 | - | 455(+) |
| 4-26 | 45 | 165 | 15 | 140 | - | 365 |
| 5-26 | 155 | 610 | 30 | 105 | (+) | 900(+) |
| 6-26 | 140 | 265 | 105 | - | (+) | 510(+) |
| 7-26 | 85 | 40 | 15 | - | - | 140 |
| 8-26 | 60 | - | 150 | - | - | 210 |
| 9-26 | 60 | - | - | - | - | 60 |
| 11-26 | 10 | - | - | - | - | 10 |
| 12-26 | 30 | - | - | - | - | 30 |

| | | | | | | |
|---|---|---|---|---|---|---|
| 13-26 | 10 | - | - | - | - | 10 |
| 14-26 | 35 | - | - | - | - | 35 |
| 15-26 | 10 | - | - | - | - | 10 |
| 1-27 | 60 | 50(+) | - | - | 100 | 210(+) |
| 2-27 | 55 | 125(+) | 35 | - | 60 | 275(+) |
| 3-27 | 20 | 55(+) | 95 | - | - | 170(+) |
| 4-27 | 40 | 230 | 60 | 135 | - | 465 |
| 5-27 | 185 | 295 | 170 | 110 | (+) | 760(+) |
| 6-27 | 20 | - | 10(+) | 60(+) | (+) | 90(++) |
| 7-27 | - | - | 25(+) | (+) | (+) | 25(++) |
| 8-27 | - | - | - | (+) | - | (+) |
| 9-27 | - | - | - | (+) | - | (+) |
| 12-27 | 40 | - | - | - | - | 40 |
| 13-27 | 65 | - | - | - | - | 65 |
| 14-27 | 25 | - | - | - | - | 25 |
| 15-27 | 65 | - | - | - | - | 65 |
| 16-27 | 45 | - | - | - | - | 45 |
| 1-28 | 10 | 195(+) | 155(+) | (+) | (+) | 360(++) |
| 2-28 | - | 290(+) | 340(+) | 215(+) | (+) | 845(++) |
| 3-28 | 140 | 220(+) | 265(+) | 174(+) | (+) | 799(++) |
| 4-28 | 280 | 150(+) | 345(+) | 640(+) | (+) | 1415(++) |
| 5-28 | 105 | 40(+) | 155(+) | 95(+) | (+) | 395(++) |
| 6-28 | - | (+) | (+) | 70(+) | (+) | 70(++) |
| 7-28 | - | - | (+) | (+) | - | (+) |
| 8-28 | - | - | (+) | (+) | - | (+) |
| 9-28 | - | - | - | - | 15 | 15 |
| 14-28 | 60 | - | - | - | - | 60 |
| 15-28 | 20 | - | - | - | - | 20 |
| 16-28 | 55 | - | - | - | - | 55 |
| 17-28 | 10 | - | - | - | - | 10 |
| 22-28 | 10 | - | - | - | - | 10 |
| 23-28 | 5 | - | - | - | - | 5 |
| 1-29 | 235 | 270(+) | 255(+) | 191(+) | (+) | 951(++) |
| 2-29 | 30 | 110(+) | 360(+) | 89(+) | (+) | 589(++) |
| 3-29 | 40 | (+) | 145(+) | 40(+) | (+) | 225(++) |
| 4-29 | 40 | (+) | 25(+) | 15(+) | (+) | 80(++) |
| 5-29 | - | 45(+) | 175(+) | (+) | (+) | 220(++) |
| 6-29 | - | (+) | (+) | (+) | (+) | (++) |
| 7-29 | - | - | (+) | (+) | (+) | (+) |
| 16-29 | 65 | - | - | - | - | 65 |
| 17-29 | 45 | - | - | - | - | 45 |
| 18-29 | 45 | - | - | - | - | 45 |
| 19-29 | 20 | - | - | - | - | 20 |
| 20-29 | 20 | - | - | - | - | 20 |
| 21-29 | 15 | - | - | - | - | 15 |
| 22-29 | 75 | - | - | - | - | 75 |
| 23-29 | 5 | - | - | - | - | 5 |
| 1-30 | - | 69 | - | - | - | 69 |

(+) = long periods (one to several hours) of unrecorded time spent in township by field assistants.
(++) = several hours to days of unrecorded time spent in township.

Appendix II. Ferruginous Hawk nesting and banding data, 1991 (* = nest structure; ** = modified nest).

| Location | Nest tree or shrub | Tree hgt. (m) | Nest hgt. (m) | Nest width (cm) | Nest depth (cm) | Total no. yg. | No. yg. fledged & banded |
|---|---|---|---|---|---|---|---|
| SE28-7-16 | Cottonwood | 15.2 | 8.4 | - | - | 0 | 0 |
| WC28-9-18 | Maple | 10.7 | 7.8 | 104.1 | 38.1 | 3 | 3 |
| EC 5-11-19 | Maple | 12.2 | 8.5 | 91.4 | 61.0 | 3 | 0 |
| NE 9-3-22 | Cottonwood* | 21.3 | 10.7 | 86.4 | 35.6 | 0 | 0 |
| SW31-4-22 | Cottonwood | 16.8 | 13.7 | - | - | 0 | 0 |
| EC 5-5-22 | Maple | 8.5 | 5.8 | 71.1 | 27.9 | 0 | 0 |
| SW21-5-22 | Green Ash** | 12.2 | 8.8 | 94.0 | 61.0 | 1 | 1 |
| NW35-5-22 | Willow Tree | 7.6 | 5.6 | 86.4 | 48.3 | 4 | 4 |
| WC32-4-23 | Maple* | 6.1 | 5.2 | 94.0 | 45.7 | 3 | 3 |
| SW 2-5-24 | Maple | 7.0 | 5.8 | 108.0 | 43.2 | 4 | 4 |
| C 14-8-24 | Maple | - | - | - | - | 0 | 0 |
| SW13-4-25 | Cottonwood | 18.3 | 11.6 | 76.2 | 30.5 | 3 | 3 |
| NW 3-7-25 | Willow | 4.6 | 3.7 | 78.7 | 48.3 | 0 | 0 |
| NW15-7-25 | Maple | 6.5 | 4.9 | 106.7 | 58.4 | 4 | 4 |
| WC21-7-25 | Cottonwood | - | - | - | - | 0 | 0 |
| NE23-7-25 | Aspen | 10.7 | 9.0 | 86.4 | 45.7 | 2 | 2 |
| C 7-8-25 | Cottonwood | 18.3 | 10.7 | 88.9 | 73.7 | 0 | 0 |
| SW18-8-25 | Willow shrub | 2.6 | 2.6 | 109.2 | 73.7 | 0 | 0 |
| NE29-8-25 | Willow shrub | Reported by D. Hatch | | | | 2+ | 0 |
| NW19-1-26 | Aspen | 9.5 | 9.1 | - | 76.2 | 2 | 2 |
| NE 7-2-26 | Elm | 4.6 | 2.3 | 81.3 | 48.3 | 0 | 0 |
| NW 9-3-26 | Maple* | 5.5 | 3.7 | 106.7 | 55.9 | 2 | 2 |
| WC20-3-26 | Maple | 8.5 | 6.7 | 76.2 | 61.0 | 3 | 2 |
| C 10-5-26 | Cottonwood* | 15.2 | 9.1 | - | - | 0 | 0 |
| NW18-5-26 | Aspen* | 6.7 | 5.2 | 78.7 | 66.0 | 0 | 0 |
| NE32-5-26 | Willow tree | 7.6 | 4.0 | 96.5 | 30.5 | 3 | 3 |
| SW24-6-26 | Cottonwood | 16.8 | 12.2 | - | - | 3 | 0 |
| SE35-6-26 | Aspen | 7.6 | 5.5 | 101.6 | 55.9 | 2 | 2 |
| SE24-2-27 | Elm | 9.1 | 5.5 | 88.9 | 53.3 | 0 | 0 |
| C 31-4-27 | Cottonwood | 18.3 | 10.2 | 92.7 | 66.0 | 2 | 2 |
| C 36-4-27 | Maple | 9.1 | 4.0 | 91.4 | 30.5 | 2 | 2 |
| NC 1-5-27 | Spruce | 15.3 | 11.3 | 76.2 | 50.8 | 3 | 3 |
| WC 5-5-27 | Maple* | 10.7 | 7.3 | 87.6 | 55.9 | 4 | 4 |
| NE19-5-27 | Aspen | 11.4 | 7.8 | 83.8 | 30.5 | 2 | 2 |
| NE 5-3-28 | Cottonwood | 18.3 | 13.7 | 87.6 | 22.9 | 5 | 5 |
| SE16-3-28 | Cottonwood | 18.3 | 13.9 | 96.5 | 66.0 | 1 | 1 |
| NW30-3-28 | Aspen | 12.1 | 11.3 | - | - | 0 | 0 |
| C 33-3-28 | Cottonwood | 15.2 | 9.3 | 99.0 | 58.4 | 4 | 4 |
| NW 1-4-28 | Cottonwood* | 13.7 | 9.8 | 94.0 | 45.7 | 2 | 2 |
| NW 9-4-28 | Cottonwood | 19.8 | 15.2 | 76.2 | 86.4 | 3 | 3 |
| SE22-4-28 | Aspen | 10.7 | 6.6 | 91.4 | 45.7 | 3 | 1 |
| NE23-4-28 | Willow Tree* | 7.6 | 4.0 | 76.2 | 76.2 | 0 | 0 |
| NW26-4-28 | Aspen | 10.7 | 9.8 | - | - | 3 | 3 |
| SW28-4-28 | Aspen | 8.5 | 6.9 | 86.4 | 45.7 | 3 | 3 |
| NE 2-5-28 | Cottonwood | 16.8 | 13.4 | 101.6 | 116.8 | 0 | 0 |
| C 3-5-28 | Cottonwood* | 16.8 | 10.1 | 106.7 | 53.3 | 2 | 2 |
| NE12-1-29 | Cottonwood* | 15.2 | 6.6 | 95.3 | 40.6 | 4 | 4 |
| SE23-1-29 | Maple* | 6.1 | 4.3 | 81.3 | 35.6 | 0 | 0 |

APPENDIX III. Details of Ferruginous Hawk sightings during 1991 (excluding sightings within 2 km of active nests).

| | |
|---|---|
| SW 1-14-1e | One seen near south mound of Oak Hammock Marsh (18 Oct.-- R.Koes) |
| SW22-14-3E | Immature observed near Oak Hammock Marsh (4 Sept. -- C.Blicq and others). Same bird? found in marsh soaked and malnourished on 9 Sept -- rehabilitated at Assiniboine Zoo and released. |
| S 13-1-7 | Two Ferruginous Hawks observed during spring hawk watches along the Pembina River valley (1 & 6 April -- A.& D.Schritt). |
| NW 1-4-13 | Immature seen in good hunting pasture (21 Aug. -- M.Conrad). |
| SE17-5-14 | Subadult found dead along highway (1 Aug. -- C.Higgs, S.Hohn). |
| E 26-2-16 | Adult seen in flight over a cultivated field (10 May). 1990 nest in 1-3-16 blew down, may have been a few sticks added to it. |
| SE13-8-16 | One observed over native grasslands (13 May -- G.Holland). |
| NW22-8-16 | One observed over native grasslands (24 June -- G.Holland). |
| SE11-10-16 | One observed over sand dune area (13 May -- G.Holland). |
| NE16-3-18 | Adult seen near good hunting pasture (12 July -- M.Conrad). |
| NC28-9-18 | Adult seen perched on 1990 nest (22 April) at the same time a pair were at nest in WC28 (1 km away). Nest checked in June - no material had been added! Nest subsequently blew down. |
| SW10-3-19 | Adult on fence near extensive valley (19 April). |
| NW17-3-21 | Adult seen on ground in good pasture (22 May). |
| SW22-3-21 | Adult flying over pasture & hayland (11 July). |
| SE30-9-23 | Adult seen in cultivated field (11 June -- D.Chranowski, P.Ewasko). |
| NW24 & W36-16-23 | Adult observed on two occasions in late September (J. Larson). |
| NE34-11-24 | Adult in good hunting pasture (3 June -- D.Chranowski). |
| NE 8-4-25 | Adult observed near good hunting pasture (11 July). |
| SW13-4-25 | Third adult briefly joined nesting pair during banding (4 July). |
| SW27-5-26 | Subadult seen near good hunting pasture (28 June). Same bird? observed on 3 May in hayland in NE27. |
| NW31-6-26 | Adult in hunting pasture close to 1990 nesting site (22 May). |
| NE24-13-27 | Pair on grassy hillside (16 June -- C.Findley, K.Belcher). |
| NW20-3-28 | Subadult near good hunting pasture (4 June). |
| NW22-3-28 | Pair in good hunting pasture (23 May). |
| SW28-3-28 | Adult flew from NW27 to pasture in SW28 (17 April). |
| SW11-4-28 | Adults (1-2) seen in hunting pasture here on several occasions. |

APPENDIX IV. Ferruginous Hawk nest structures erected in Manitoba during 1991.

| Location | Structure height (m) | Tree/shrub height (m) | Substrate/ situation |
|---|---|---|---|
| NW14-7-12 | 1.6 | 16.8 | Lone cottonwood within good pasture. |
| WC 9-6-14 | 5.5 | 7.0 | Lone maple in extensive pasture. |
| SE28-6-14 | 10.7 | 16.8 | Open cottonwoods in willow shrub clump in hayland near extensive pasture. |
| EC20-6-15 | 7.9 | 12.2 | Lone elm in cropland 100m from extensive pasture. |
| C 27-6-15 | 5.5 | 7.6 | Lone elm among scattered shrubbery on edge of extensive pasture. |
| NW30-6-15 | 9.1 | 10.7 | Isolated aspen 100m from trail in large pasture. |
| C 6-5-22 | 12.5 | 16.8 | Open balsam poplar bluff in small pasture near fallen 1990 Ferruginous nest. |
| SW17-5-22 | 7.9 | 9.1 | Row of elms in old farmstead in extensive pasture. |
| C 35-5-22 | 7.6 | 12.2 | Lone cottonwood within extensive pasture. |
| SC 8-4-25 | 12.5 | 16.8 | Isolated cottonwoods in crop 50m from extensive pasture. |
| NW22-5-25 | 9.1 | 12.2 | Isolated cottonwood in pasture/hayland. |
| SW10-7-25 | 8.2 | 10.7 | Few maples in old farmstead near hayland/pasture. |
| NE15-7-25 | 6.7 | 9.1 | Lone willow tree among willow shrubs in hayland near good pasture. |
| SW 9-8-25 | 3.0 | 4.8 | Lone elm tree in good pasture. |
| SE25-12-25 | 4.6 | 6.1 | Modified small nest in isolated aspens along seldom-used trail near hayland & pasture. |
| SC 6-1-26 | 6.7 | 12.2 | Lone cottonwood near ridge in extensive pasture. |
| WC19-1-26 | 7.6 | 10.7 | Small maple clump at base of slope in extensive grassland valley. |
| SE31-1-26 | 5.2 | 7.6 | Open willows along abandoned railroad in pasture. |
| SE18-2-26 | 9.8 | 13.7 | Lone cottonwood 200m from trail in large pasture. |
| SC17-3-26 | 4.6 | 6.1 | Lone ash in idle strip 200m from large pasture. |
| NW18-3-26 | 6.1 | 9.1 | Scattered ash & shrubs adjacent good pasture. |
| C 30-4-26 | 7.6 | 10.7 | Isolated maples near hayland & extensive pasture. |
| SW36-4-26 | 9.1 | 10.7 | Modified magpie nest in isolated maples adjacent pasture, hayland & crop. |
| SE 4-5-26 | 11.3 | 13.7 | Small, open aspen bluff in crop 50m from extensive pasture. |
| C 6-5-26 | 5.5 | 7.6 | Isolated maples between good pasture & crop. |
| SW10-5-26 | 11.6 | 16.8 | Isolated cottonwood between hayland & pasture. |
| NE15-5-26 | 10.7 | 16.8 | Isolated cottonwood within large pasture. |
| NW19-5-26 | 9.8 | 13.7 | Isolated cottonwood 100m from edge of pasture. |
| EC28-5-26 | 7.0 | 10.7 | Lone elm among willow shrubs near edge of pasture. |
| WC35-5-26 | 9.1 | 18.3 | Open cottonwood, aspen & willow shrub bluff in cropland 400m from good pasture. |
| NW14-6-26 | 6.1 | 10.7 | Isolated elm in old farmstead near large pasture. |
| SW 6-3-27 | 7.6 | 16.8 | Lone cottonwood 250m from edge of good pasture. |
| NW21-5-27 | 6.1 | 7.6 | Small aspen bluff adjacent trail and pasture. |
| C 30-1-28 | 10.7 | 12.2 | South end of green ash/maple hedgerow between cropland & pasture. |
| NE35-2-28 | 10.7 | 18.3 | Lone cottonwood within extensive pasture. |
| NE 4-3-28 | 10.7 | 18.3 | Lone cottonwood along seldom-used trail. |
| NE 5-3-28 | 9.1 | 15.2 | Isolated cottonwoods near fallen 1991 Ferruginous nest in recently cultivated pasture. |
| SE15-3-28 | 9.1 | 16.8 | Cottonwoods in crop 300m from good pasture. |
| SE16-3-28 | 12.2 | 15.2 | Isolated cottonwoods in extensive pasture. |
| NW17-3-28 | 12.2 | 16.8 | Isolated cottonwoods in extensive pasture. |
| SW29-3-28 | 10.7 | 15.2 | Lone cottonwood among willow shrubs within extensive pasture. |
| SE30-3-28 | 10.7 | 18.3 | Lone cottonwood among willow shrubs in hayland 600m from extensive pasture. |
| SE34-3-28 | 4.6 | 7.6 | Lone maple in strip of pasture. |
| C 4-4-28 | 6.1 | 7.6 | Lone elm in cropland 200m from good pasture. |
| C 6-4-28 | 10.7 | 18.3 | Isolated cottonwoods & ash within good pasture. |
| NC 8-4-28 | 9.1 | 18.3 | Cottonwood among willow shrubs in cropland 300m from extensive pasture. |
| NC10-4-28 | 9.1 | 16.8 | Cottonwood in hayland 0.5 km from good pasture. |
| SC11-4-28 | 6.1 | 10.7 | Edge of open cottonwood bluff in idle area close to good pasture. |
| SW13-4-28 | 6.1 | 10.7 | Row of maples in crop 0.5 km from good pasture. |
| NW13-4-28 | 10.7 | 18.3 | Cottonwood 200m from edge of small pasture. |
| NE15-4-28 | 11.6 | 13.7 | Cottonwood 300m from edge of large pasture. |
| WC21-4-28 | 9.1 | 13.7 | Cottonwood among willow shrubs near edge of extensive pasture. |
| NW26-4-28 | 6.1 | 9.1 | Aspen near edge of small bluff in pasture close to fallen 1991 Ferruginous nest. |
| NW27-4-28 | 4.6 | 7.6 | Lone aspen within extensive pasture. |
| SC33-4-28 | 7.6 | 12.2 | Lone cottonwood by dugout in extensive pasture. |
| NE 2-5-28 | 10.7 | 15.2 | Lone cottonwood within extensive pasture (400m from failed 1991 Ferruginous nest). |
| SW11-5-28 | 10.1 | 12.2 | Modified an abandoned hawk nest in small aspen bluff within extensive pasture. |
| C 36-2-29 | 12.2 | 18.3 | Isolated cottonwoods and willow shrubs near extensive pasture. |

APPENDIX V. Suitable areas for Burrowing Owls based on surveys of grasslands throughout southern Manitoba, 1987-1991.

| Township-Range | Very good sites | Good sites | Fair sites |
|---|---|---|---|
| 14-1E | | SE15 | |
| 14-3W | | | NW6 |
| 15-3 | | S30 | |
| 14-4 | | | N35 |
| 15-4 | | SE23,SE25, 26 | N11,S14,S36 |
| 17-4 | | SW33 | |
| 18-4 | | NW6 | |
| 1-5 | | | W27 |
| 14-5 | | | W1 |
| 2-6 | | | SE5,NW9,NE20 |
| 8-6 | | | WC10,NW10 |
| 1-7 | | SE4 | |
| 6-7 | | | SE23 |
| 1-8 | | | NC7 |
| 1-9 | | | C19 |
| 11-9 | | NW32 | |
| 12-9 | | SW1 | S4 |
| 1-10 | SW7,NE22 | NW22,SE27,NW27,NE33,N36 | SE9 |
| 2-10 | | NW13,E21 | |
| 13-10 | | | SE24 |
| 1-11 | | E12 | |
| 2-11 | | | NW17 |
| 3-11 | | E12,SE20 | |
| 1-13 | | | NE7,SE17 |
| 2-13 | | SW8,NW8,SE28 | S7,SW15,SW22 |
| 4-13 | | | SW25,SE35 |
| 7-13 | | SE5 | |
| 21-13 | | | W2 |
| 1-14 | | NW17 | E5,NW5 |
| 2-14 | | NE27 | SW25 |
| 4-14 | | | SW24 |
| 6-14 | | SW28 | NW12,SW24,SE33 |
| 1-15 | | NW20,SE26 | NE9,NW10,NE21 |
| 3-15 | | | SW18 |
| 5-15 | | | NE1 |
| 6-15 | | SW13,NE20,E30,NW30,SW35 | SE19,NW21,NW27 |
| 7-15 | | S29 | |
| 1-16 | | | SW24 |
| 3-16 | | | E1 |
| 6-16 | | | NE25,SE29,NW31 |
| 7-16 | | SC9,N21,SW27,S28,SW30 | SE3,NW22 |
| 11-16 | | N9 | N4,NE5,SW18 |
| 1-17 | | NE1 | |
| 2-17 | | | SW35 |
| 4-17 | | SE19 | |
| 5-17 | | W16 | NE34 |
| 6-17 | | | SE3,SW34,SE36 |
| 7-17 | | | NE14 |
| 9-17 | | N22,S34 | |
| 10-17 | | S14 | NE23 |
| 2-18 | | | SE36 |
| 3-18 | SW20,NW20,SW29,NW29 | SE1,NE16,SE19,SW30 | SW3,NE3,NE25,NE27 |
| 4-18 | | | SE23,NW34 |
| 5-18 | | SW1 | |
| 7-18 | | SE5,SE8 | |
| 8-18 | | | SE8,NW30,NE34 |
| 9-18 | | NW23,SW26,NW26,SW33 | NW19 |
| 10-18 | | N3,NE6,NE7,NE12,S13 | NW2 |
| 11-18 | | | SE23 |
| 2-19 | SW30 | NC31 | NW18 |
| 3-19 | | EC12,N14,NW19 | |
| 5-19 | SC16 | NC9 | |
| 6-19 | | SE16,NW16 | SW2,NW34 |
| 7-19 | | SE34 | SW7,SW14 |
| 8-19 | | SE34 | NW30 |
| 9-19 | SE17 | NE7,NE15,NW15,NE17,SW26,SW29 | NE16,NE33 |
| 10-19 | | SE7,NW16,NE32,N33 | SW2,SE3 |
| 11-19 | | NE5 | SE9 |

| | | | |
|---|---|---|---|
| | | | SE34,NE35,SE35 |
| 3-20 | S30 | NE17,S18,NE18,SE19,SC20,S21, WC5 | |
| 4-20 | | SW29 | |
| 6-20 | | SW2,NE25 | SW14,SE15 |
| 7-20 | | NW31,E36 | SW13 |
| 8-20 | SE25,N25 | SE1 | |
| 9-20 | | WC5,SW16,C16,WC17 | SE2 |
| 10-20 | | WC4,NE11 | |
| 11-20 | | S26,SW29,NE30 | |
| 2-21 | | SE7,N17,SW21,NW22 | NE18 |
| 3-21 | | SW15,WC16 | NW18 |
| 4-21 | | NW8 | |
| 6-21 | | NW35 | NE25 |
| 7-21 | | | SW2 |
| 8-21 | | NW30 | NW36 |
| 9-21 | | EC18 | |
| 10-21 | | SE15 | NW12,SW14 |
| 12-21 | | SW32 | NE2,NW32 |
| 2-22 | | CW8,S9,NE20 | |
| 3-22 | | NW19,NE28,NW28,SW30 | SW10,NW18,SE34 |
| 4-22 | | SE29,SW35 | |
| 5-22 | NE35 | | NW1,NE16 |
| 6-22 | | | NW27 |
| 7-22 | | SW25 | |
| 8-22 | | SW2,SW12,ALL 32,W33 | |
| 10-22 | | S3,NW3,ALL 4,W5,NE10 | |
| 11-22 | NE4,SE9,SE10 | SE17 | |
| 1-23 | | NW34,NE35 | |
| 2-23 | ALL 19 | SW3,SE4,SW32 | S17,SE31,S32 |
| 3-23 | NE1,SE10 | W8,SE25,NE30 | SW2 |
| 4-23 | NW18 | SW9,NW16,S21 | |
| 5-23 | | NW3,SE13,SE16,NE16, | |
| 7-23 | NE17 | NW23,NE24,SE30,NW30 | |
| 8-23 | NW2,SE3,N35 | SW1,SW11 | NW15 |
| 9-23 | | SE1 | NW34 |
| 10-23 | | | |
| 12-23 | | EC5,SW6,NW20,NW23,NW26 | |
| 1-24 | E18,SE19,SW20 | NE6,NE34,NW35 | SE10,NE36 |
| 2-24 | | NE11,WC19 | NW8,NE10,SE11 |
| 3-24 | | SW11,NE11,SE14,SE15, | SW6,NE22,NE33 |
| 4-24 | NE15,C21 | NW19,NW29,NE30,NW34,SE35, | |
| 5-24 | SE3 | SC1,NW16,NE29 | NE4,NE11,SW11,SE12, SE14,SE29,E30 |
| | | NE25 | NW1,SE6,WC6 |
| 7-24 | | SE11,NW32 | NE23,NE26,E27 |
| 8-24 | | NE5,NW6,NW7 | |
| 9-24 | | E16,NE21 | |
| 10-24 | | SE18,E27,SW30,N34 | |
| 11-24 | | SC6,SC16,SW18,NW23 | |
| 2-25 | E28 | NE23 | NE24 |
| 3-25 | | EC8,NE10,NW12,E14,E16, | NE24,NE35,NE36 |
| 4-25 | NE8 | NW17,NE19,SE24,SE35 | |
| | | NE3,NE13,NE27 | S2,NE21,SE28 |
| 5-25 | | SE13,NW13,SW36 | NE24 |
| 6-25 | NE25 | NE7,NW13,SW22,NE24, | W8,NW9,NW14 |
| 7-25 | SE19,NE31 | SW25,N26 | |
| 8-25 | SE8,W9,SW16,SE17,S18 | SW4,NE4,NW17,N33 | S23 |
| 9-25 | | NW4,NE12 | W4,W9 |
| 10-25 | | | SW32 |
| 11-25 | | NE12 | SW28 |
| 13-25 | | | |
| 1-26 | | W5,E6,SE7,W8,NW17,E19,W20,W29 | |
| 2-26 | SE18, | NW6,W7,W18,NE31,NW31,NW32 | SW5,SW6,W7,W9,SW36 |
| 3-26 | NW8,NW16,SW21 | SE18,NE28,NW29,NW32 | |
| 4-26 | SW2,NE11,NW30 | SE4,NW7,WC27,EC31,NW33,E35, | |
| 5-26 | NW5,NW19,E34,SC34 | W3,SE6,SW6,NW7,NE10,NW16, | |
| | | SW18,SE19,SW27,SE28,NE31 | SE14,SW34 |
| 6-26 | SW6 | S1,NE8,SE13,NE14,SE16,SW16 | |
| | | SW20,SW24,NE25,SE26,NW27,SW29, | |
| | | SW30,SW31,NW31,NW34,SE35,NW35 | |
| | | SW14,SW17,SE24 | |
| 7-26 | | SE5,EC6,NE12,WC25 | SW15 |
| 8-26 | NW5,NW17,SW24 | | NE20 |
| 9-26 | | | |
| 10-26 | | | |

| | | | |
|---|---|---|---|
| 1-27 | E23 | SE19,NW24 | N16,SE18,NW23 |
| 2-27 | NE12,SE13,SC17 | SC14,SE17,SW21 | NE2 |
| 3-27 | | E13 | SW6,SE26 |
| 4-27 | W3,NW25 | EC27,SW28 | NW5,NW35 |
| 5-27 | NE10,SW16,NE24 | W5,W11,E13,N14,N16, SE19,S20,N21,SE22,NW22,SW24 | |
| 6-27 | | | NW24,SE26,SW34 |
| 7-27 | | | NW7,NE29,SE32 |
| 8-27 | | NW18,SW19,NW26 | |
| 12-27 | | | NE31,SW33 |
| 13-27 | | | NW20 |
| 15-27 | | SE26 | NW24,W29,SW35 |
| 16-27 | | | NE15 |
| 1-28 | | SE30,NW30,NW35 | SW7,SE7,SW19,SW20,N29 |
| 2-28 | | SW22,NE35 | SW4,NW16,NC33 |
| 3-28 | NW6,NW8,W15,E16, NW16,SW17,W22 | NW1,SE9,NW9,NW17,SE18, SE20,NE27,NW29,S31,SW33 | |
| 4-28 | W11,SC8,SE33 | NW1,SW2,SE4,NW6,S8,SE14, WC14,NE23,N26,N27,NW28, NW31,NW32,N34,SE35 | SW16,SE20,E21,N22 |
| 5-28 | SE1,SW3,SW5 | NE1,S6,SE13,SW14, NE23,SW25,NW27,SW34 | NW24,S26 |
| 6-28 | | | SC1 |
| 7-28 | | NW9 | W29,E30 |
| 8-28 | | SE24,NW24,W34 | |
| 9-28 | | N8 | |
| 12-28 | | N3,NE4,SE9 | NW28,NE29,N30 |
| 21-28 | | SE29 | |
| 22-28 | | NE30,NE31 | |
| 23-28 | | S6 | |
| 1-29 | NW13,SE24 | N1,N2,NW6,E11,WC12,SW16 SW21,NW22,NE33,NE34 | E7,SE8,E21,S22, SE23,NE26,E27 |
| 2-29 | NW34 | SW12,SC13,SW18,NW22, WC23,SE33,EC34 | NE26,SW36 |
| 3-29 | E24 | SW2,SE3,SE13,NE14,SW15 | SW21,NW22 |
| 4-29 | | NE2,SE10,SW11,E13,SE28 | NW1,SE9,WC22,NE30,NW34 |
| 5-29 | | SE9,NW9,SW13,SW25,SE30 | SW2,NE4,NE14,NW21,E26, NW25,SW28,NE30,SE31,NE35 |
| 6-29 | | | WC10,NW15,NW22 |
| 7-29 | | SE12,SE35 | NE1 |
| 12-29 | | | SE36 |
| 16-29 | | W14 | |
| 18-29 | | NE32 | |
| 19-29 | | SW4,SE5 | |
| 20-29 | | SE30 | SW4 |
| 22-29 | | NW16,NW21,N36 | SE28 |
| TOTALS: N=173 | 81 | 401 | 231 |

APPENDIX VI. Burrowing Owl nesting and banding data in Manitoba during 1991.

| Location | Comments | Max. no. young | No. banded Yg. | No. banded Ads. |
|---|---|---|---|---|
| **PAIRS** | | | | |
| MA22-1-10 | Pair present until mid-June. | 0 | - | - |
| SW 1-5-18 | Pair present until early June. | 0 | - | - |
| MA22-3-21* | Pair present until late June. | 0 | - | - |
| ME17-6-22 | Pair present until mid-May. | 0 | - | M[3] |
| ME15-4-24* | | 7 | 7 | M[3]F[3] |
| ME29-4-26* | Pair last seen in mid-May. | 0 | - | M[3] |
| SW22-7-25 | Pair present until late July. | 0 | - | - |
| SW 9-8-25(S)* | | 7 | 7 | F |
| SE19-1-26 | | 3 | 3 | F |
| SE32-3-26 | | 8 | 8 | M |
| MA30-4-26 | | 7 | 7 | F[3] |
| NW 7-5-26* | Pair present until late May. | 0 | - | - |
| SE34-5-26(N) | | 7 | 7 | M[2] |
| SE34-5-26(S)* | Female disappeared in early July. | 9 | 9 | M[3]F[1] |
| SE23-1-27* | Female not seen after mid-July. | 7 | 7 | M[3]F[2] |
| SE13-2-27 | | 4 | 4 | M[4]F |
| ME17-2-27* | Pair briefly around 1990 burrow in April. | 0 | - | - |
| EC27-4-27 | Pair present until late June. | 0 | - | M[3] |
| ME24-5-27* | | 7 | 0 | M[1] |
| ME35-2-28 | Female killed on road (early brood-rearing). | 6 | 6 | M |
| SW 2-4-28 | | 6 | 6 | M[4]F[2] |
| SE24-1-29 | | 6 | 6 | - |
| SW36-2-29 | Male disappeared in early July. | 4 | 4 | M |
| **SINGLES** | | | | |
| SW16-10-20* | Resident male from 1990 seen throughout May. | - | - | M[3] |
| ME15-4-24 | Male? noted on three occasions in late June. | - | - | - |
| SE21-4-24 | Male? first noted in late June. | - | - | M[3] |
| SW 9-8-25(N) | Male? seen at burrow 7-10 May. | - | - | - |
| SE34-5-26(SW) | Lone male seen throughout July. | - | - | M |
| SW11-4-28 | Female? responded to playback (16 May). | - | - | - |
| SE35-4-28 | Male? seen at burrow June 4-10. | - | - | M[3] |
| NW13-1-29(N)* | Female? seen until mid-May. | - | - | - |
| NW13-1-29(S)* | Female? seen until mid-June. | - | - | - |
| SE24-1-29 | Male? seen in pasture July 25. | - | - | - |

**OTHER PROBABLE NESTING SITES BASED ON RELIABLE REPORTS (SEE APPENDIX VII)**

ME17-3-20, SE25-8-20, SW16-10-20, ME16-6-22, SW18-8-25, SC21-1-29, MA22-4-29

* 1990 nesting site reoccupied.
[1] Banded as an adult during 1990.
[2] Banded as an adult during 1989.
[3] Banded as a juvenile during 1990.
[4] Banded as a juvenile during 1989.
[5] Banded as a juvenile during 1988.

APPENDIX VII. Unverified 1991 Burrowing Owl reports and previously unrecorded historic sites.

| | |
|---|---|
| Winnipeg | One observed in cultivated field NW of junction of Route 90 & Inkster Highway in mid-July, 1991 (L. Iwaszewski). |
| Rosser | Traditional nesting pasture 1 mile SW of Rosser, Manitoba used until the late 1980s (A. Hamilton). |
| NE 2-13-9 | Pair seen at burrow in crop while harvesting (late Aug. - early Sept) during both 1990 and 1991 (R. Rogers). |
| NW 1-14-9 | Lone bird seen at burrow in crop while harvesting (Oct 1-2, 1991; D. Poschenreider). |
| NE12-13-10 | Pair seen along drainage ditch on 4 May, 1991 (N. Paryniuk). |
| NW 31-6-16 | Single owl observed going down a burrow in extensive pasture during summer 1990 (D. McDonald). |
| NE 4-10-18 | Single owl observed in pasture on 18 April, 1991 (C. Meadows). |
| NW18-2-19 | Single owl seen on 3 occasions in late April, 1991. On an old badger mound in small pasture (C. Dixon, M. Walker). |
| NE17-3-20 | Pair observed on hill in pasture during late May, 1991 (D. Dyck). |
| SE25-8-20 | Landowners (C. & M.Deaming) observed 1-2 owls in hayland in spring, 1991. Found an injured owl along roadside in August. |
| SW16-10-20 | Landowner (J. Cooper) said that two pairs were present during June, 1991. We had seen a single owl on several occasions, however, the entire pasture was not scanned on each occasion. By late summer, no owls were present and badgers had dug out every burrow in pasture. |
| NE16-6-22 | S. & B. Hunt had seen a pair in this pasture and pair at NE17-6-22. Both disappeared in late May, 1991. |
| SW 8-8-22 | D. Brown reported a family group in cropland for 2-3 years during the late 1980s. Site had been pasture and is now hayland. |
| SW18-2-23 | Landowner (W. Bowden) saw B. Owls on posts beside pasture throughout summer, 1990. |
| NE11-3-24 | Landowner (Hobbs) says B. Owls nested in good pasture by yard in mid-1980s. |
| SW13-2-25 | Pair nested in pasture until foxes took over burrow in late 1980s (D.Wickham). |
| NE14-3-25 | Landowner (K. Voth) had 1 owl in pasture by yard throughout summer during late 1980s. |
| SW 8-4-25 | Pair reportedly using burrow in flax field during 1990 (K. Voth). |
| SW18-8-25 | Historic site. Pair observed among sparse shrubbery on ridge (May, 1991 -- Mrs. L. Vodon). |
| NW33-1-26 | One by burrow in stubble field on 29 May, 1991. Landowner (J. McKinney) left a small strip unseeded but owl(s) left. |
| SE34-4-26 | One(+) by burrow in cultivated field --30 & 31 May, 1991 (G.Robson) |
| NW10-2-27 | Landowner saw one by burrow in small pasture by yard in spring, 1991 |
| SW16-1-29 | Landowner observed owls in pasture in 1990 (L. Redpath). |
| SC21-1-29 | Pair of owls observed near a burrow in extensive pasture on 12 May, 1991 , but not reported until fall (J. Arnell, P. Rakowski). |
| NW22-4-29 | Landowner (M.Philip) saw pair by burrow in alfalfa field at least twice during June, 1991. |
| SW20-14-29 | One observed going into a burrow in canola field (late Aug., 1991 - C. Bartley). |

APPENDIX VIII. Loggerhead Shrike observations in Manitoba during 1991, including nesting and banding data.

| Location | Dates (eggs) | Dates (young) | No. banded yg. | ad. |
|---|---|---|---|---|
| NE 7-12-3E | | June 24 (6+ fledged) | 3 | |
| SW 8-12-3E | Nest found in hedgerow (D. Hatch) | | | |
| SW 9-12-3E | Nest found in lone ash tree (D. Hatch) | | | |
| SE10-12-3E | | June 24 (6) | 6 | |
| NW18-12-3E | Pair in hedgerow during July (D. Hatch) | | | |
| SE13-13-3E | Single shrike seen throughout June near hedge (R. Koes) | | | |
| NE 1-5-2E | One seen near pasture/hayfield edge (17 Aug. -- R.Berger) | | | |
| Twp 9- Rge 2E | | June 24 (6) | 6 | |
| Twp 11- Rge 2E | | June 24 (6) | 6 | |
| SW16-5-15 | One seen near pasture (12 June -- G. Holland) | | | |
| SE27-6-15 | | | | |
| NW24-8-16 | Two seen on 8 & 15 May (G. Holland) | | | |
| SW34-6-17 | May 27 (7) | June 17 (6) | 6 | |
| NW19-10-17 | Pair observed throughout the summer (J. Horton) | | | |
| NW28-2-18 | | | | |
| SE19-3-18 | May 24 (4) | June 21 (5) | 5 | |
| NE30-3-18 | May 24 (2), Jn 21 (0)* | | | |
| | Family group later noted at this site (C. Higgs, S. Hohn) | | | |
| SW 4-5-18 | | | | |
| SW19-3-19 | | | | |
| NE 7-10-19 | | June 24 (1** +4y) | 4 | |
| EC32-10-19 | | June 17 (1** +6y) | 6 | 1*** |
| NE 9-24-19 | Adults seen at nest during June (C. Higgs) | | | |
| SE22-2-20 | | | | |
| SW23-3-20 | | | | |
| SW16-10-20 | | Jn 17 (1** + 5y), Jn 24 (5) | 5 | |
| SC18-5-22 | | | | |
| SW15-9-22 | | | | |
| NE25-7-23 | | | | |
| NE 2-7-24 | | | | |
| NW26-8-24 | Nesting pair reported (D. Hatch) | | | |
| NW 8-9-24 | One reported in mid-May (D. Braddell) | | | |
| NW21-2-25 | | | | |
| SE28-2-25 | | | | |
| CW 9-4-25 | | July 11 (7) | 7 | |
| SW16-4-25 | May 22 (1), Jn 21 (0)* | | | |
| NE21-7-25 | | | | |
| SW 4-2-26 | May 28 (6) | June 12 & 19 (6) | 6 | 1+1*** |
| SW34-4-26 | | | | |
| SW10-5-26 | June 5 (7) | June 20 (1** +6y) | 6 | |
| WC10-5-26 | June 5 (7) | June 20 (7) | 7 | |
| NE15-5-26 | | June 20 (4) | 4 | |
| NW19-5-26 | June 7 (7) | June 20 (1** +4y), Jn 23 (4) | 4 | 1 |
| NW28-5-26 | June 7 (6) | June 20 (6) | 6 | |
| SW 1-6-26 | | | | |
| SW 7-6-26 | | July 12 (5+ fledged) | | |

| | | | | | |
|---|---|---|---|---|---|
| NW 7-6-26 | | | July 24 (5+ fledged) | | |
| NC18-6-26 | | | June 27 (2** & 1+ fledged) | | |
| NW31-6-26 | (initial) | May 22 (6), Jn 20 (0)* | | | |
| | (renest) | July 5 (5) | July 19 (2) | 2 | |
| NE 1-7-26 | | | June 27 (6), July 5 (0)* | | |
| NE 6-7-26 | | | June 20 (1** +5y) | 5 | |
| NW 7-7-26 | | | June 27 (2+ fledged) | 1 | |
| NW 8-7-26 | One reported in mid-May (D. Braddell) | | | | |
| EC 6-8-26 | | | June 27 (6) | 6 | |
| NE 9-8-26 | | | June 27 (1** +4y) | 4 | |
| SE14-8-26 | | | | | |
| NW17-8-26 | | | Jn 27 (5; 1 dead), Jy 5 (4) | 4 | 1*** |
| NE14-1-27 | | May 29 (6), Jn 19 (0)* | | | |
| SE22-1-27 | | | (3+ fledged; no nest found) | | |
| NW30-3-27 | (initial) | | June 11 & 12 (6), Jn 19 (0)* | | |
| | (renest) | | July 23 (4) | 4 | |
| SE32-3-27 | | | | | |
| SE25-4-27 | | | July 10 (3+ fledged) | | |
| NW31-4-27 | | | | | |
| SE17-5-27 | | June 6 (7) | Jn 12 (1**+6y),Jn 20 (1**+5) | 5 | |
| NW17-5-27 | | | Jn 18 (1** +5y), Jn 23 (2) | 2 | |
| NE18-5-27 | | June 11 (6) | June 20 (4), June 25 (0)* | | |
| NW18-5-27 | | My 24 (4),Jn 12 (2+3y) | June 22 (5) | 5 | |
| SW23-5-27 | | | (3+ fledged; no nest found) | | |
| NE23-5-27 | | June 7 (6) | June 20 (6) | 6 | |
| NW23-5-27 | | | | | |
| NW26-5-27 | | May 28 (2) | June 23 & 25 (5) | 5 | |
| SE31-5-27 | | | July 12 (6) | 6 | |
| NE 3-6-27 | | | June 20 (5) | 5 | |
| NC 3-6-27 | | | June 27 (1** +5y) | 4 | |
| NW 5-6-27 | | | | | |
| SW22-6-27 | | | June 27 (4** +3y) | 3 | |
| NW23-6-27 | | | | | |
| SE24-6-27 | | June 6 (6) | June 20 (6) | 6 | |
| NW24-6-27 | | June 6 (7) | June 20 (7) | 7 | |
| NE25-6-27 | | | June 20 (6) | 6 | |
| NE27-6-27 | | | | | |
| WC15-7-27 | | | June 27 (1+ fledged) | 1 | |
| SE17-7-27 | Observed throughout summer (I. Milliken) | | | | |
| NE29-7-27 | First observed 21 July (I. Milliken) | | | | |
| NE 8-8-27 | Observed throughout summer (I. Milliken) | | | | |
| NE31-8-27 | First observed 5 June (I. Milliken) | | | | |
| SE 3-9-27 | | | | | |
| SW 6-9-27 | | | June 27 (5) | 5 | |
| SE 7-9-27 | | | June 27 (2+ fledged) | | |
| NW10-9-27 | One observed 30 May (I. Milliken) | | | | |
| NE13-1-28 | | | | | |
| NE16-1-28 | | | (4+ fledged; no nest found) | | |
| NW18-1-28(S) | | | | | |
| NW18-1-28(N) | | May 21 (5), My 30 (7) | June 19 (7) | 7 | |
| SE19-1-28 | | May 23 (7) | June 12 & 18 (6) | 6 | |
| SE20-1-28 | | | | | |
| SW20-1-28(E) | | May 29 & 30 (6) | June 13 & 18 (2** +4y) | 4 | |
| SW20-1-28(W) | | | June 13 & 19 (7) | 7 | |

| | | | | |
|---|---|---|---|---|
| NE20-1-28 | May 29 (7) | June 12 (1** +5y), June 19 & 22 (5) | 5 | |
| SW26-1-28 | June 3 (5) | June 12 & 22 (4) | 4 | |
| NW26-1-28 | | | | |
| NE29-1-28 | | | | |
| NE31-1-28 | | | | |
| SE32-1-28 | May 29 & Jn 13 (5) | June 24 (5) | 5 | |
| SE33-1-28 | | | | |
| NW36-1-28 | | June 18 & 22 (7) | 7 | 1 |
| SC 2-2-28 | | | | |
| SW 2-2-28 | | June 18 & 21 (7) | 7 | 2 |
| SE 3-2-28 | | | | |
| NE 5-2-28 | | | | |
| NW 5-2-28(S) (init) | May 17 (1+),May 30 (0)* | | | |
| (renest) | June 4 (5) | June 12 (5), June 24 (4) | 4 | |
| NW 5-2-28(N) | May 23 & 30 (6) | June 12 (6), June 19 (4+) | 4 | |
| SE 7-2-28 | May 23 (4), May 30 (6) | June 12 & 19 (6) | 6 | |
| NE 7-2-28(E) | May 21 (1), May 23 (3), May 30 (7), Jn 10 (0)* | | | |
| NE 7-2-28(W) | June 6 (6) | June 22 (6) | 6 | |
| NE 8-2-28 | May 30 (6) | June 18 (6) | 6 | 1 |
| NW 8-2-28(E) | May 30 (7), Jn 6 (7) | June 18 (7) | 7 | |
| NW 8-2-28(W) | May 30 (4), Jn 6 (4) | June 19 & 21 (2) | 2 | |
| SE 9-2-28 | June 13 (7) | June 25 (7) | 7 | 1 |
| NW 9-2-28 | My30 (1), Jn 4 &10 (6) | June 24 & 26 (6), Jn 28 (4) | 4 | |
| SW17-2-28 | Jy3 (1),Jy 9,11 &19 (6) | July 30 (6) | 6 | |
| NW20-2-28 | Jn 13 (6),Jn 25 (1+5y) | Jn 28, Jy 2 & 3 (6) | 6 | 1 |
| SE21-2-28 | | | | |
| NW21-2-28 | | | | |
| SE22-2-28 | | | | |
| SC26-2-28 | May 30 (7) | Jn 10 (7), Jy 23 (4+ fledged) | | |
| NE26-2-28 | June 10 (3 + 4y) | June 21 & 26 (5) | 5 | 1 |
| SE27-2-28 | May 29 (7), Jn 6 (7) | June 21 (1** +6y) | 6 | 1 |
| SW27-2-28 | | | | |
| SE29-2-28 | | July 3 (1+ fledged) | | |
| NW30-2-28 | | June 13 (1** +6), Jn 20 (6) | 6 | |
| NW31-2-28 | June 13 (5 +2e) | June 23 (4) | 4 | 1 |
| SW33-2-28 | June 25 & 26 (7) | July 2 & 9 (7) | 7 | 1 |
| NE33-2-28 | | | | |
| NW33-2-28 | My17 (2),My 21 &30 (6) | Jn 10, 14 & 18 (1** + 5y) | 5 | |
| SE 2-3-28 | | | | |
| NE 5-3-28 | May 23 (5) | June 12 & 21 (6) | 6 | 2 |
| NW 5-3-28 | May 16 (3) | June 12, 13 & 18 (7) | 7 | 1*** |
| NE 8-3-28 | | | | |
| SE17-3-28 | Jn 10 (2), Jn 12 (4), Jn 18 & 28 (6) | July 2 & 9 (6) | 6 | |
| SE18-3-28 | May 16 (1), June 4 (6) | June 12 (6), June 18 (0)* | | |
| SE19-3-28 | June 4 (7) | June 12 & 18 (7) | 7 | 1*** |
| NE19-3-28 | | | | |
| SE20-3-28 (initial) | June 12 (1e +6y) | June 18 (0)* | | |
| (renest) | July 12 (5e +1y) | July 23 (3) | 3 | |
| SE21-3-28 | June 5 (7) | June 11 & 18 (7) | 7 | |
| NW28-3-28 | | June 26 (4) | 4 | |
| NW29-3-28 | May 16 (2), June 4 (7) | June 10 & 18 (7) | 7 | |

| | | | | |
|---|---|---|---|---|
| SW30-3-28 | July 9, 19 & 22 (7) | July 30 (7), August 2 (5) | 5 | |
| NE30-3-28 | | | | |
| WC30-3-28 | June 12 (6) | June 25 (6) | 6 | |
| NW 5-4-28 | Jn 4 (7),Jn 11 (2+5y) | June 12 & 21 (7) | 7 | |
| SW 6-4-28 | | | | |
| SW 7-4-28 | | | | |
| NW 8-4-28 | | June 14 & 21 (5) | 5 | |
| NE 8-4-28 | June 4 & 12 (6) | June 21 & 26 (6) | 6 | 2 |
| SW 9-4-28 | Jn 8 & 21 (7), Jn25 (0)* | | | 1*** |
| NW10-4-28 | | | | |
| SW12-4-28 | June 4 (7), Jn 21 (0)* | | | |
| NW13-4-28 | June 4 & 12 (6) | June 21 & 24 (6) | 6 | 1 |
| SE16-4-28 | May 22 (3), Jn 4 (5) | June 12 & 21 (5) | 5 | |
| NE20-4-28 | | | | |
| SE22-4-28(S) | June 12 (7) | Jn 26,28 & Jy2 (7),Jy 3 (6) | 6 | 1+1*** |
| SE22-4-28(N) | | | | |
| NE26-4-28 | | | | |
| NC26-4-28 | | July 5 (6) | 6 | |
| SE27-4-28(N) | June 7 (6) | June 12 (6), June 21 (1) | 1 | |
| SE27-4-28(S) (init) | June 4 (6) | June 12 (6), June 21 (0)* | | |
| (renest) | July 3 & 11 (6) | July 16 & 22 (6) | 6 | 1 |
| NW27-4-28 | June 21 (4), Jy 3 (2), Jy 9 (1), Jy 19 (0)* | | | |
| SE28-4-28 | Jn21 & 26 (6), Jy9 (0)* | | | |
| NE28-4-28 | Jn 8 (6),Jn 12 (4+2y) | June 23 (6) | 6 | 2 |
| NW28-4-28 | Jn 8 (7), Jn 11 (2+5y) | Jn 21 (3) | 3 | 2 |
| SW32-4-28 | July 3 & 11 (7) | July 22 (5y - 4 dead) | 1 | |
| WC34-4-28 | | | | |
| SE35-4-28(S) | | | | |
| SE35-4-28(N) | June 4 (0)* | | | |
| SW36-4-28 | My 29 (6),Jn 12 (4+2y) | June 23 (3) | 3 | 1 |
| SE 3-5-28 | | | | |
| SE 4-5-28 | May 23 (3) | June 12 (7), June 21 (1) | 1 | |
| SW14-5-28 | | | | |
| NW14-5-28 | | June 12, 17 & 20 (6), | 5 | 1 |
| NE17-5-28 | June 17 (5) | July 2, 6 & 9 (4) | 4 | |
| SW19-5-28 | June 6 (6) | June 11 (2** + 4), Jn 20 (4) | 4 | 2 |
| EC20-5-28 | | | | |
| SW21-5-28 | | | | |
| SE22-5-28 | May 27 (5), Jn 11 (6) | Jn 17 (1** +2),Jn 20 (1** +1) June 23 (0)* | | |
| NE23-5-28 | | | | |
| NW23-5-28 | May 30 (7), Jn 12 (7) | June 18 (7), June 28 (0)* | | 1*** |
| SW26-5-28 | May 30 (4) | June 18 & 25 (6) | 6 | |
| SW33-5-28 | | | | |
| NW 2-6-28 | | | | |
| SE 3-6-28 | | | | |
| NW11-6-28 | | | | 1*** |
| NE22-6-28 | June 5 (2 + 5y) | June 18 (1** +6y) | 6 | |
| NE24-6-28 | June 27 (6) | July 7 (5), July 19 (0)* | | |
| SW 7-7-28 | | June 27 (5+ fledged) | 5 | |
| NW 7-7-28 | | | | |
| NE21-7-28 | One observed - 1 June (I. Milliken) | | | |
| NW10-11-28 | One observed -4 July (I. Milliken) | | | |

| | | | | |
|---|---|---|---|---|
| SW16-1-29 | | | | |
| NE16-1-29 | My23 & 30 (6),Jn 19 (0)* | | | |
| EC17-1-29 | May 24 (1),May 30 (6), June 13 (1 + 5y) | June 19 & 23 (6) | 6 | 1+1*** |
| SW23-1-29 (initial) | My30 &Jn 6 (7),Jn20(0)* | | | |
| (renest) | June 22, 25 & Jy 3 (6), July 9 (2 + 4y) | July 12 (4), July 19 (3) | 3 | 1 |
| SE23-1-29 | | June 25 (5+ fledged) | | |
| WC32-1-29 | June 5 (6) | June 12 & 19 (6) | 6 | |
| SW 2-2-29 | May 24 (2) | June 19 & 24 (3) | 3 | |
| WC22-2-29 | May 23 (5) | Jn 12 (2**+4), Jn 19 (2**+3) | 3 | 1 |
| NW22-2-29 | | June 19 (1** +6y), Jn 20 (6) | 6 | 1*** |
| SW27-2-29 (initial) | May 17 (2) | June 12 (6), Jn 19 (0)* | | |
| (renest) | July 10 & 19 (6) | July 30 (2) | 2 | |
| SW32-2-29 | May 23 (1), Jn 4 (7), June 12 (3 - cold) | | | |
| NW34-2-29 (initial) | May 16 (1), Jn 19 (0)* | | | |
| (renest) | June 19 (5), Jy 3 (5) | July 19 (1** +4y) | 4 | |
| SE 1-3-29 | June 6 (5) | June 12 (5), Jn 20 (4) | 4 | |
| NW 1-3-29 | May 24 (7) | June 18 (7) | 7 | |
| SW12-3 29 | May 23 (7), June 4 (7) | June 12 & 18 (7) | 7 | |
| NE12-3-29 | | June 20 (7) | 7 | |
| SE16-3-29 | | | | |
| NW21-3-29 | May 30 (3), Jn 12 (7) | June 24, 26 & 28 (5) | 5 | |
| NW22-3-29 | | | | |
| SC24-3-29 | May 22 (2), Jn 23 (0)* | | | |
| SW25-3-29 | | | | |
| NE25-3-29 | | | | |
| SE 1-4-29 (initial) | May 16 (1), Jn 4 (0)* | | | |
| (renest) | Jn 12 (6),Jn 25 (1+5y) | July 2 & 3 (5) | 5 | 1 |
| SE18-4-29 | June 6 (7) | June 18 (7) | 7 | |
| NE36-4-29(W) | June 28 & Jy 2 (6), Jy 10 (2), Jy 19 (0)* | | | 1 |
| NE36-4-29(E) | May 24 (5) | June 7 & 18 (1** +6y) | 6 | 1 |
| SW 3-5-29 (initial) | May 24 (2), My 30 (7), June 6 (0)* | | | |
| (renest) | Jn21 &24 (6),Jy2 (1+5y) | July 6 & 9 (4) | 4 | |
| NE 9-5-29 | May 30 (5),Jn 7 (2+3y) | June 18 (5) | 5 | |
| NW11-5-29 | | June 10 & 18 (7) | 7 | |
| NE13-5-29 | | June 7 & 20 (6) | 6 | 1 |
| SW16-5-29 | | | | |
| NE16-5-29 (initial) | May 24 (6), My 30 (0)* | | | |
| (renest) | June 20 (2e,4yg) | June 28 (4) | 4 | |
| NW18-5-29 | | | | |
| SW20-5-29 | | | | |
| NW20-5-29 | My30 & Jn6 (6),Jn20 (0)* | | | |
| SE22-5-29 | | June 14 & 20 (7) | 7 | 2 |
| EC24-5-29 | May 28 (7) | June 18 & 23 (5) | 5 | 1 |
| WC27-5-29 | June 6 (5) | June 17 (4), June 24 (0)* | | |
| SE30-5-29 | | June 18 (7), July 10 (5+ fledged,1 dead) | 7 | |
| SW32-5-29 | | | | |
| NC32-5-29 | May 28 (7) | June 5 & 18 (7), Jn 21 (5) | 5 | |
| SE34-5-29 | June 18 (6) | July 9 (1+ fledged) | | |

| | | | |
|---|---|---|---|
| SE 8-6-29 | | | |
| SE15-6-29 | | | |
| SW25-6-29 | | June 27 (7) | 7 |
| SW35-6-29 | | | |
| SE 1-7-29 | | June 27 (1+ fledged) | |
| NE 2-7-29 | | | |
| SW13-7-29 | 1 reported in mid-June (R. Parsons) | | |

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* Evidence of depredation
** Addled egg(s)
*** Previously banded as a juvenile

APPENDIX IX. Baird's Sparrow, Grasshopper Sparrow, Sprague's Pipit and Chestnut-collared Longspur observations in Manitoba during 1991 (numbers seen or heard in parenthesis) and habitat (P=pasture, I=idle, H=hayland, HA=alfalfa/brome hayland, C=cropland).

| Location | Ba.Sparrow | Gr.Sparrow | Sp. Pipit | C.C.Longspur | Habitat |
|---|---|---|---|---|---|
| NW28-1-5 | | | | Jn 10 (8) | P |
| SE 4-1-7 | | Jn 10 (1) | | | P |
| NW11-1-10 | | Jn 10 (1) | | | H |
| NW22-1-10 | | Jn 10 (2) | | My24,Jn10 (3) | I |
| SE27-1-10 | | My 24,Jn 10 (1) | | My24,Jn10 (3) | I |
| NW27-1-10 | | | | My 24 (1) | P |
| N 4-8-14 | My 22 (2; G.Holland) | | May22-Jn24 (0-6; G.H.) | | I |
| | | May22-Jn24 (3-10; G.H.) | | My22-Jn24 (0-2; G.H.) | |
| S 8-8-14 | | " " (3-6) | " " (1-3) | " " (0-2) | I |
| NW30-6-15 | | | Jn 14 (1) | | P |
| NW21-7-15 | | My 27 (1) | | | P |
| SE36-1-16 | | | | Apr 19 (2) | P |
| NE 1-2-16 | | | May 10 (1) | | HA |
| NE25-6-16 | | Jn 14 (1) | | | P |
| [illegible]2-7-16 | | May 27 (1) | | | HA |
| [illegible]W22-7-16 | | My27,Jy29 (1) | | | P |
| N 13-8-16 | | My-Jn (5-9) | My22-Jn24 (8-13; G.Holland) | | I |
| NE21-8-16 | May 22 (2) | My22-Jn24 (0-2; G.Holland) | | | I |
| N 22-8-16 | My22,Jn 1 (1) | " " " (0-4) | My22-Jn24 (1-5; G.Holland) | | I |
| SE23-8-16 | | My-Jn (1-4) | My23-Jn23 (4-5; G.Holland) | | I |
| N 24-8-16 | | My-Jn (3-7) | My21-Jn23 (0-8; G.Holland) | | I |
| NW 2-9-16 | | Jn 11 (2; G.H.) | | | I |
| N 14-9-16 | | Jn 11 (1) | My21-Jn2 (0-3; G.Holland) | | I |
| SE11-9-16 | May 21 (1 - G.Holland) | | | | I |
| S 18-9-16 | May 17 (4 - G.Holland) | | | | I |
| E 30-9-16 | My21-Jn23 (2-4; G.Holland) | | May21-Jn23 (6-9; G.H.) | | I |
| | | My21-Jn23 (0-3; G.H.) | | " " (9-12;G.H) | I |
| E 31-9-16 | My21-Jn23 (0-1; G.Holland) | | " " (0-6; G.H.) | | I |
| | | " " (0-2; G.H.) | | " " (0-3;G.H) | I |
| NW18-3-18 | | My24,Jn14 (1) | | | C |
| NE18-6-19 | | Jy 2 (1) | | | P |
| SW18-3-20 | | | | May 24 (7) | P |
| SE34-3-20 | | My 29 (1) | | | P |
| NE35-3-20 | | My 29 (1) | | | P |
| NE25-8-20 | | | Jy 26 (2) | | P |
| SE36-8-20 | | | Jy 26 (1) | | P |
| SW25-2-21 | | | May 10 (1) | | P |
| SE29-2-21 | Jy 22 (1) | | | May 10 (1) | P |
| SW29-2-21 | | | | May 10 (3) | P |
| NE14-3-21 | | | | May 24 (2) | P |
| NE17-3-21 | May 24 (1) | | | | HA |
| NE17-3-21 | | | | May 24 (2) | P |
| NW17-3-21 | | | | May 24 (3) | P |
| SW21-3-21 | | | | May 24 (2) | P |

| | | | | | |
|---|---|---|---|---|---|
| NW22-3-21 | May 24 (1) | | | | H |
| NW22-3-21 | | | | May 24 (2) | P |
| SW24-3-21 | May 24 (1) | May 24 (1) | | May 24 (2) | HA |
| SW 9-3-22 | | | | May 24 (6) | P |
| NE 9-3-22 | | | | May 24 (4) | P |
| SE11-3-22 | May 24 (1) | | | | HA |
| NE20-3-22 | May 17 (3) | | | May 17 (2) | P |
| SW17-6-22 | | May 29 (1) | | | P |
| SE25-8-22 | | | | May 14 (2) | P |
| NE31-10-22 | Jy 8 (1) | Jy 8 (1) | Jy 8 (1) | Jy 8 (4) | P |
| NW32-10-22 | | | | Jy 8 (10) | P |
| SE 3-11-22 | | | | Jy 8 (10) | P |
| SW 3-11-22 | Jy 8 (1) | | | Jy 8 (3) | P |
| SE 4-11-22 | | | | Jy 8 (2) | P |
| SW 4-11-22 | | | Jy 8 (1) | Jy 8 (3) | P |
| NW 4-11-22 | Jy 8 (1) | | | | P |
| SE 5-11-22 | | | | Jy 8 (20) | P |
| SE 9-11-22 | | Jy 8 (1) | | Jy 8 (6) | P |
| SE10-11-22 | Jy 8 (1) | | | Jy 8 (4) | P |
| SW 6-2-23 | | | Jy 11 (1) | | P |
| NE18-2-23 | | | | May 10 (1) | P |
| SE19-2-23 | Jy11 (3) | Jy 11 (1) | Jy 11 (1) | May 10 (6) | P |
| SW19-2-23 | Jy11 (1) | | | May 10 (8) | P |
| NE19-2-23 | | | | May 10 (4) | P |
| NW19-2-23 | | | | May 10 (6) | P |
| NW30-2-23 | | | | May 10 (1) | P |
| NE34-2-23 | | | | May 10 (8) | P |
| NW34-2-23 | | | | May 10 (3) | P |
| NW35-2-23 | | | | May 10 (1) | P |
| SW 3-3-23 | | | | May 10 (1) | P |
| NE 8-4-23 | | | | Apr 19 (3) | P |
| SE17-4-23 | | | | Apr 19 (2) | P |
| NW18-4-23 | | | | May 29 (3) | P |
| NE30-4-23 | May 29 (1) | | | May 29 (6) | P |
| NE 4-7-23 | | | Apr 24 (1) | | H |
| NW31-7-23 | | May 22 (1) | | | HA |
| SE18-1-24 | | | | Jy 11 (10) | P |
| SW18-1-24 | | | | Jy 11 (4) | P |
| NE18-1-24 | | | | Jy 11 (6) | P |
| NE18-1-24 | Jy 11 (1) | Jy 11 (1) | | | HA |
| SE19-1-24 | | | | Jy 11 (3) | P |
| SW20-1-24 | Jy 11 (2) | | | Jy 11 (10) | P |
| NE11-4-24 | Jy 11 (1) | | | Jy 11 (15) | P |
| SW22-4-24 | My 17 (1) | | | My 17 (2) | P |
| NW29-4-24 | | | | My17,My22 (3) | P |
| SE30-4-24 | | | | My 22 (2) | P |
| NE30-4-24 | | | | My17,My22 (5) | P |
| SE31-4-24 | | | | My 17 (2) | P |
| SW31-4-24 | | | | My 17 (1) | P |
| NE31-4-24 | | My 22 (2) | | | P |
| NW31-4-24 | | | My 17 (1) | My 17 (2) | P |
| NE32-4-24 | | | | My 2 (4) | P |
| NW32-4-24 | | My 22 (2) | My 22 (1) | My 2,My22 (6) | P |
| SW33-4-24 | My 29 (1) | My 29 (1) | | | HA |

| | | | | | |
|---|---|---|---|---|---|
| SW34-4-24 | My 17 (2) | | My 17 (1) | My 17 (2) | P |
| SE 1-5-24 | | | | My 9 (4) | P |
| SW 5-5-24 | | | | My 22 (4) | P |
| NW 5-5-24 | | | | My 22 (3) | P |
| SE 6-5-24 | | | | My 22 (4) | P |
| NE 6-5-24 | | | | My 22 (2) | P |
| SE12-5-24 | | | | My 9 (2) | P |
| NE13-5-24 | | | | My 22 (2) | P |
| SE29-5-24 | | | | My 22 (3) | P |
| SE30-5-24 | | | | My 2 (6) | P |
| SE31-6-24 | | | | My 14 (2) | P |
| SW31-6-24 | | | | My 14 (4) | P |
| NE 2-7-24 | | My 22 (1) | My 22 (2) | | H |
| NE25-7-24 | | | My 22 (2) | My 22 (2) | P |
| NE30-7-24 | | | Apr 24 (1) | | P |
| SE36-7-24 | | | | My 22 (1) | P |
| NE22-8-24 | | | | Apr 24 (1) | P |
| NE32-8-24 | | Jn 3 (3) | | Apr24,Jn3 (2) | I |
| SW 4-9-24 | Jn 3 (2) | | | | P |
| SE 7-9-24 | | | Jn 3 (1) | | P |
| NE 7-9-24 | | | | Jn 30 (4) | P |
| NE11-9-24 | | | Jn 3 (1) | | P |
| SW16-2-25 | | | | My 9 (2) | P |
| NE 8-4-25 | | | | My 2 (2) | P |
| SW12-4-25 | | | | My 2 (2) | P |
| NE15-4-25 | | My 22 (1) | | | P |
| NE16-4-25 | | | | My 22 (2) | P |
| NW17-4-25 | | | | My 9 (3) | P |
| NE21-4-25 | | My 29 (2) | | My 7 (4) | P |
| SE35-4-25 | | | My 17 (1) | | P |
| NE36-4-25 | | | | My 17 (4) | P |
| NW36-4-25 | | | My 17 (1) | My 17 (1) | P |
| SE27-4-25 | | My 29 (5) | | My 29 (5) | P |
| SW27-5-25 | My 29 (1) | My 29 (1) | | | P |
| NE27-5-25 | | My 29 (6) | | My2,7&29 (10) | P |
| NE25-6-25 | | | | My 7 (5) | P |
| NW25-6-25 | | | | My 14 (4) | P |
| NW30-6-25 | | | My 14 (4) | My 14 (6) | H |
| SW31-6-25 | My 14 (1) | | My 14 (2) | My 14 (3) | H |
| NE31-6-25 | | | My 14 (1) | | H |
| NW32-6-25 | | | | My 14 (3) | H |
| NE33-6-25 | | | My 14 (1) | | H |
| SW35-6-25 | | My 14 (1) | My 14 (2) | My 14 (2) | H |
| SW36-6-25 | My 14 (1) | | My 14 (1) | My 14 (2) | P |
| SE 3-7-25 | | | My 14 (1) | My 14 (2) | H |
| NW 3-7-25 | | | My 7 (1) | | H |
| SE 5-7-25 | | | My 14 (1) | My 14 (3) | H |
| NE 9-7-25 | | | My 7 (1) | | HA |
| NW14-7-25 | | | | My 22 (1) | P |
| NE15-7-25 | My 22 (1) | | My 22 (1) | | P |
| SE16-7-25 | | | My 7 (1) | | P |
| SW16-7-25 | | | My 7 (1) | | P |
| SE21-7-25 | | | My 7 (2) | | H |
| NE21-7-25 | | | My 7 (2) | | H |

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|---|---|---|---|---|---|---|
| SE22-7-25 | | | My 22 (1) | | | P |
| SW22-7-25 | Jy 24 (1) | | My7,Jy24 (4) | My7 (2) | | P |
| NE22-7-25 | | | Apr 24 (1) | | | H |
| NW22-7-25 | | | My 7 (1) | | | H |
| SE23-7-25 | | | My 22 (2) | | | P |
| NE23-7-25 | Jy 8 (1) | | | | | H |
| NW23-7-25 | My 22 (1) | | Apr24,My22 (1) | | | H |
| NE27-7-25 | | | My 7 (3) | | | H |
| SE34-7-25 | | | My 7 (1) | My 7 (1) | | P |
| NE34-7-25 | | | My7,My22 (3) | | | H |
| NW34-7-25 | | | My 22 (2) | | | H |
| NW35-7-25 | | | My 7 (1) | | | H |
| SW 3-8-25 | My 22 (2) | | My 22 (3) | | | H |
| NW 3-8-25 | My 22 (2) | | My 22 (3) | | | H |
| SE 4-8-25 | My 22 (1) | | My 22 (2) | | | H |
| SW 4-8-25 | Jy 8 (2) | | Jy 8 (1) | My 7 (5) | | P |
| NE 4-8-25 | | | | Apr24,My7 (5) | | P |
| NW 4-8-25 | Jy 8 (1) | | My 22 (2) | | | HA |
| NE 5-8-25 | Jy 8 (1) | | | | | P |
| NE 5-8-25 | Jy 8 (1) | | | | | H |
| NW 7-8-25 | My 22 (2) | | | | | HA |
| SE 8-8-25 | My 22 (1) | | | My7,My22 (3) | | P |
| NE 8-8-25 | My 22 (2) | My 22 (1) | My 7 (1) | | | H |
| NW 8-8-25 | | | My 7 (1) | | | H |
| SE 9-8-25 | My 22 (3) | | | Apr24,My7 (8) | | P |
| SW 9-8-25 | | | | Apr 24 (3) | | P |
| NW 9-8-25 | | | | Apr24,My7 (10) | | P |
| SW16-8-25 | | | | My 7 (2) | | P |
| SE17-8-25 | | | | My 7 (12) | | P |
| SW17-8-25 | | | | My 7 (2) | | HA |
| SE18-8-25 | | | My 7 (2) | My 7 (4) | | P |
| SW18-8-25 | | | My22,Jy8 (2) | My7,My22 (2) | | P |
| NE 4-9-25 | | Jn3 (1) | | Jn 3 (5) | | P |
| SE28-10-25 | | | | Apr 26 (4) | | P |
| SW 5-1-26 | | | | My 28 (2) | | P |
| SE 6-1-26 | | | | My 28 (5) | | P |
| NE 6-1-26 | | | | My 28 (5) | | P |
| SE 7-1-26 | | | | My 28 (6) | | P |
| SW 8-1-26 | | | | My 28 (15) | | P |
| NW 8-1-26 | | | | My 28 (20) | | P |
| SW17-1-26 | | | | My 28 (4) | | P |
| NW17-1-26 | | | | My 28 (10) | | P |
| SE18-1-26 | | | | My 28 (4) | | P |
| NE18-1-26 | | | | My 28 (6) | | P |
| NW18-1-26 | My 14 (1) | | | | | P |
| SE19-1-26 | My 28 (1) | | | My 28 (10) | | P |
| NE19-1-26 | My 28 (2) | | | My 28 (6) | | P |
| SW20-1-26 | | | | My 28 (4) | | P |
| NW20-1-26 | | | | My 28 (10) | | P |
| SW29-1-26 | | | | My 28 (10) | | P |
| SE30-1-26 | | | | My 28 (2) | | P |
| NE31-1-26 | | | | My 28 (2) | | P |
| SE32-1-26 | My 14 (1) | | | | | P |
| SE 6-2-26 | | | | My 28 (2) | | P |

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|---|---|---|---|---|---|
| SW 6-2-26 | | | | My 28 (2) | P |
| NW 6-2-26 | | | | My 28 (8) | P |
| SW 7-2-26 | | | | My 28 (12) | P |
| NW 7-2-26 | | | | My 28 (15) | P |
| SE18-2-26 | | | | Apr23,My28 (3) | P |
| SW18-2-26 | | | | My 28 (13) | P |
| NE31-2-26 | My 28 (1) | My 28 (2) | | Apr23,My28 (3) | P |
| NW31-2-26 | My 28 (1) | | | My 28 (2) | P |
| NW32-2-26 | My 28 (1) | | | My 28 (5) | P |
| SE 4-3-26 | | | | My 28 (1) | P |
| SW 4-3-26 | | | | My 28 (3) | P |
| SW 5-3-26 | | | | Apr23,My28 (6) | P |
| SE 6-3-26 | | | | My 28 (2) | P |
| NE 7-3-26 | Jn 5 (1) | | | | P |
| NW 8-3-26 | | | | Jn 5 (6) | P |
| SE19-3-26 | Jn 5 (1) | Jn 5 (1) | | | H |
| SW20-3-26 | | Jn 5 (1) | | | H |
| NE28-3-26 | | | | My10,Jn5 (15) | P |
| SW30-3-26 | | | | Apr17 (1) | P |
| NW32-3-26 | | | My 10 (1) | My 10 (2) | P |
| NW30-4-26 | Jn 5 (1) | | | My 9 (2) | P |
| NW 3-5-26 | | Jn 5 (1) | Jn 5 (1) | | P |
| NW 5-5-26 | | | My1,My10 (2) | My10 (6) | P |
| SW 6-5-26 | | | | My 10 (2) | P |
| NW 7-5-26 | Jy 22 (2) | | | Apr17,My1 (2) | P |
| NE10-5-26 | Jn 5 (1) | | | | P |
| SW18-5-26 | Jy11 (1) | Jy 11 (1) | | Apr 17 (2) | P |
| NW19-5-26 | | | | Apr17,My7 (3) | P |
| SE21-5-26 | | | | My 17 (1) | P |
| SE28-5-26 | | | | Apr18,My3 (4) | P |
| NW28-5-26 | | | My 2 (1) | | P |
| NW30-5-26 | | | My 16 (1) | My 16 (1) | P |
| NE31-5-26 | | | | My2,My7 (8) | P |
| NE32-5-26 | | | | My 2 (4) | P |
| SE34-5-26 | Jy 8 (1) | | | My 2 (10) | P |
| SE 1-6-26 | | | My 14 (1) | My 14 (2) | P |
| SW 1-6-26 | My 14 (1) | | My 14 (1) | | P |
| SE 5-6-26 | | | | My 2 (6) | P |
| SE13-6-26 | | | My 14 (1) | | P |
| NE14-6-26 | | | My 14 (1) | | P |
| SE19-6-26 | | | My 7 (1) | | P |
| NE19-6-26 | | | My 7 (1) | | P |
| NE23-6-26 | | | My 14 (1) | My14 (4) | P |
| SE26-6-26 | | | | My 14 (2) | P |
| NW27-6-26 | | | | My 7 (6) | P |
| SE29-6-26 | My-Aug (35) | My-Aug (30) | My-Aug (10) | My-Aug (25) | P |
| SW29-6-26 | | | | My-Aug (5) | P |
| NE29-6-26 | My-Aug (4) | My-Aug (2) | | | H |
| SW30-6-26 | | | My 22 (1) | My 22 (2) | P |
| SE31-6-26 | | | | My 7 (6) | P |
| SW31-6-26 | | | My 22 (1) | | P |
| NW31-6-26 | | | | My22 (2) | P |
| SW34-6-26 | | | My 7 (1) | | H |
| SE35-6-26 | Jy 5 (3) | | My 14 (1) | | P |

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|---|---|---|---|---|---|
| NE36-6-26 | My 14 (1) | | My 14 (1) | My 14 (1) | P |
| NW 2-7-26 | | | | My 7 (2) | P |
| NE 3-7-26 | | | | My 7 (2) | P |
| SE 7-7-26 | | | Apr 24 (1) | Apr 24 (1) | P |
| SW 8-7-26 | mid-May (1-D. Braddell) | | | | I |
| NE10-7-26 | | | | My 7 (2) | P |
| NW11-7-26 | | | My 7 (1) | My (6) | P |
| SE14-7-26 | | | My 7 (2) | My 7 (4) | P |
| SW14-7-26 | | | My 7 (1) | My 7 (3) | P |
| SE24-7-26 | | | | My 7 (6) | P |
| SE 5-8-26 | | | | Ap23,My22 (5) | P |
| SE 6-8-26 | | | My 22 (1) | | P |
| NE 9-8-26 | | My 22 (1) | | My 22 (6) | P |
| NE12-8-26 | My 22 (2) | | | | P |
| SE13-8-26 | My 22 (1) | | My 22 (7) | | HA |
| SE23-8-26 | My 22 (3) | My 22 (1) | | | HA |
| SE24-8-26 | Jy 8 (1) | | | | P |
| SW24-8-26 | My 22 (1) | | My 22 (1) | My 22 (2) | P |
| NE 5-1-27 | | Jn 19 (1) | | | I |
| NE12-1-27 | | Jn 19 (1) | | My 28 (15) | P |
| SE13-1-27 | | | | My 28 (10) | P |
| NE14-1-27 | | Jn 19 (1) | | | P |
| SE23-1-27 | | | | Apr 23 (6) | P |
| NE36-2-27 | | | | My 28 (2) | P |
| NW31-3-27 | | Jn 19 (1) | | | C |
| SW28-4-27 | Jn 4 (5) | Jn 4 (2) | Jn 4 (2) | Jn 4 (4) | P |
| NW31-4-27 | | | My 16 (1) | | HA |
| NW35-4-27 | | My 16 (1) | | My9,My16 (10) | P |
| SW 2-5-27 | My 16 (1) | | | | C |
| NE 4-5-27 | | | My 9 (1) | | I |
| SW 5-5-27 | | | | My 28 (1) | P |
| NW 5-5-27 | | | | My 28 (2) | P |
| NW 6-5-27 | | | | My 15 (2) | P |
| NE10-5-27 | | | | Apr 17 (3) | P |
| NW11-5-27 | | | | Apr 17 (2) | P |
| NE12-5-27 | Jy11,Jy22 (3) | | | | H |
| SE13-5-27 | | | | Apr 17 (2) | P |
| NW14-5-27 | | | | Apr 17 (3) | P |
| SE15-5-27 | | | | Apr 17 (4) | P |
| SW15-5-27 | Jy 3 (2) | | | | HA |
| SW16-5-27 | | | | My 9 (1) | P |
| NE16-5-27 | | | | Apr 17 (3) | P |
| SE19-5-27 | | | | My 14 (8) | P |
| NW21-5-27 | | | | Apr 17 (2) | P |
| SE22-5-27 | My-Aug (2) | | | | P |
| NE22-5-27 | My-Aug (30) | My-Aug (40) | My-Aug (5) | My-Aug (25) | H |
| NW22-5-27 | June (4) | | | My 7 (3) | P |
| SW23-5-27 | July (2) | | | | I |
| NW23-5-27 | | | My 7 (2) | | I |
| SE27-5-27 | July (1) | | | | I |
| SE25-6-27 | My 22 (2) | My 22 (1) | My 22 (1) | | HA |
| NE36-6-27 | | My 22 (2) | | | C |
| NW28-12-27 | | | | Apr 25 (2) | P |
| SW33-12-27 | | | | Apr 25 (3) | P |

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|---|---|---|---|---|---|
| SE 2-13-27 | | | Apr 25 (1) | | P |
| SE 7-13-27 | | | Apr 25 (1) | | P |
| NW20-13-27 | | | | Apr 25 (8) | P |
| NW20-15-27 | | | Apr 25 (1) | | P |
| SE26-15-27 | | | Apr 25 (1) | Apr 25 (3) | P |
| NW26-15-27 | | | | Apr 25 (6) | P |
| NW29-15-27 | | | Apr 25 (2) | Apr 25 (2) | P |
| SE30-15-27 | | | Apr 25 (1) | | P |
| NW33-15-27 | | | Apr 25 (2) | | P |
| SW35-15-27 | | | | Apr 25 (2) | P |
| SW 4-16-27 | | | | Apr 25 (3) | P |
| NW 6-16-27 | | | | Apr 25 (2) | P |
| SE 8-16-27 | | | | Apr 25 (4) | P |
| SW 9-16-27 | | | Apr 25 (1) | Apr 25 (8) | P |
| SW34-2-28 | | Jn 4 (1) | | | HA |
| SE 1-3-28 | | Jn 6 (1) | | | P |
| NE 5-3-28 | | | | My 23 (2) | P |
| NW 5-3-28 | My 16 (1) | | | | H |
| NE 6-3-28 | Jy 12 (1) | | | | P |
| SE 9-3-28 | | | My 23 (1) | My 23 (2) | P |
| NW 9-3-28 | | | My 23 (1) | | P |
| SW15-3-28 | | | | My 23 (4) | P |
| NW15-3-28 | | | | My 23 (6) | P |
| NE16-3-28 | | | | My 23 (4) | P |
| NW16-3-28 | | | My 26 (1) | | P |
| NW17-3-28 | | | My 26 (1) | | P |
| NE21-3-28 | | | My 26 (2) | | H |
| NW22-3-28 | Jy 12 (2) | | My26,Jy12 (1) | My 23 (6) | P |
| SE28-3-28 | My 26 (1) | | My 26 (1) | | P |
| SW31-3-28 | My 16 (1) | | Jn 6 (1) | Jn 6 (2) | P |
| NE33-3-28 | | | My 26 (1) | | P |
| NW34-3-28 | My 16 (4) | My 16 (1) | | | C |
| NE36-3-28 | | Jn 19 (1) | | | C |
| SW 2-4-28 | | | | My 15 (6) | P |
| NE 3-4-28 | Jn 4 (2) | | | Apr 17 (3) | P |
| SE 4-4-28 | | | | My 16 (2) | P |
| NW 5-4-28 | Jn 4 (1) | | | | I |
| SE 7-4-28 | Jn 12 (1) | | | | H |
| SE 8-4-28 | | Jn 12 (1) | | My 1 (2) | P |
| SW 8-4-28 | | | | My 1 (2) | P |
| NE 9-4-28 | Jn 4 (2) | Jn 4 (1) | Jn 4 (2) | | P |
| SE10-4-28 | My15,Jn 4 (3) | Jn 4 (1) | Jn 4 (2) | | H |
| SW11-4-28 | | | | Apr 17 (8) | P |
| NW11-4-28 | Jy 3 (3) | Jy 3 (1) | | | P |
| SW13-4-28 | My 15&16 (2) | | | | C |
| SE14-4-28 | My 15&16 (2) | | My 15 (1) | My 15 (8) | P |
| NW21-4-28 | My 16 (1) | | My 16 (5) | | P |
| SE22-4-28 | Jn 12 (1) | Jn 12 (1) | Jn 12 (1) | | H |
| NE22-4-28 | | | My 16 (4) | My 16 (4) | P |
| SE23-4-28 | | | | Apr 17 (3) | HA |
| NE23-4-28 | | | | Apr17,My15 (6) | P |
| SW24-4-28 | My 15 (1) | | | | C |
| NW24-3-28 | My 15 (2) | | | | C |
| NE26-4-28 | | | | My 15 (6) | P |

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| NW26-4-28 | Jy 5 (1) | | My 16 (1) | My 16 (3) | P |
| SE27-4-28 | | | My 16 (4) | | H |
| SW27-4-28 | | | | My 16 (2) | P |
| NE27-4-28 | | | My 16 (1) | | P |
| NW27-4-28 | My 16 (2) | | My 16 (1) | My 16 (4) | P |
| SE28-4-28 | | | My 16 (1) | | P |
| NW32-4-28 | | | | Apr 17 (2) | P |
| SE33-4-28 | | | My 16 (1) | My 16 (2) | P |
| SE34-4-28 | My 16 (1) | | My 16 (2) | My 16 (4) | HA |
| NW34-4-28 | Jn 14 (1) | | | | P |
| SE35-4-28 | | | | My 16 (2) | P |
| SW35-4-28 | Jn 12 (1) | Jn 12 (1) | My 16 (1) | My 16 (2) | P |
| NE 1-5-28 | | | | My 15 (8) | P |
| NW 1-5-28 | | | | Apr 17 (2) | P |
| SE23-5-28 | My 30 (3) | My 30 (1) | My 30 (1) | | HA |
| NW23-5-28 | My 30 (2) | | | | HA |
| SW24-5-28 | | | | My 30 (2) | P |
| NW24-5-28 | | | My 30 (1) | My 30 (4) | P |
| SW25-5-28 | | | | My 30 (3) | P |
| SW26-5-28 | | | | My 30 (3) | P |
| NW27-5-28 | | | | My 30 (4) | P |
| NW 1-1-29 | | | | My 15&23 (8) | P |
| NE 2-1-29 | | My 24 (1) | | My 15&24 (2) | P |
| NE 3-1-29 | My 24 (1) | My 24 (1) | | | P |
| SE 7-1-29 | | | | Apr 23 (2) | P |
| SE11-1-29 | My 15&24 (1) | | | My 15 (8) | P |
| NE11-1-29 | | | My 24 (1) | My 15&24 (20) | P |
| SW13-1-29 | | | | My 24 (2) | P |
| NW13-1-29 | | | | My 15&24 (10) | P |
| NW15-1-29 | | | My 8 (1) | | H |
| SW16-1-29 | | | My 24 (1) | My 8 (4) | P |
| SE22-1-29 | Jn 6 (1) | Jn 6 (1) | Jn 6 (1) | Jn 6 (12) | P |
| SW22-1-29 | | | My8,Jn6 (2) | Jn 6 (5) | P |
| NW22-1-29 | | | | Jn 6 (6) | P |
| SE23-1-29 | | | Jn 6 (2) | Jn 6 (2) | P |
| NE23-1-29 | | | Jn 6 (1) | Jn 6 (3) | P |
| NW23-1-29 | | | | Apr 23 (3) | P |
| SE24-1-29 | | | | My 15 (10) | P |
| NE25-1-29 | Jul-Aug (3) | Jul-Aug (2) | | | H |
| NW25-1-29 | Jul-Aug (10) | Jul-Aug (10) | Jul-Aug (5) | Jul-Aug (2) | H |
| NE26-1-29 | Jn 6 (2) | | | Jn 6 (2) | P |
| NW26-1-29 | Jul-Aug (2) | | | | P |
| SW27-1-29 | | | | Apr 23 (3) | P |
| NE27-1-29 | Jul-Aug (8) | Jul-Aug (5) | Jul-Aug (5) | | H |
| NW27-1-29 | Jul-Aug (5) | Jul-Aug (2) | Jul-Aug (5) | | H |
| SE28-1-29 | Jn 6 (2) | | Jn 6 (2) | | P |
| NE28-1-29 | | | | Jn 6 (5) | P |
| NE29-1-29 | | | My 8 (3) | | P |
| NE33-1-29 | | | | My 23 (2) | P |
| NW 1-2-29 | My 23 (2) | | | Jn 6 (2) | P |
| NE 4-2-29 | | | | My 23 (4) | P |
| SE10-2-29 | | | My 23 (1) | | H |
| SE11-2-29 | My 23 (1) | | My 23 (1) | My 23 (2) | P |
| SW11-2-29 | My 23 (1) | | My 23 (1) | | HA |

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| SE12-2-29 | | My 23 (1) | My 23 (2) | P |
| SW12-2-29 | | | My 23 (6) | P |
| SW13-2-29 | | My 23 (1) | My 23 (6) | P |
| NW22-2-29 | | | My 16&23 (3) | P |
| NE34-2-29 | | | My 8&16 (6) | P |
| NW34-2-29 | | | My 16 (6) | P |
| NW21-3-29 | My 30 (1) | | | H |
| NW21-5-29 | | | My 30 (3) | P |
| SW28-5-29 | | | My 30 (3) | P |
| NE21-17-29 | | | Apr 25 (2) | P |
| NW21-17-29 | | | Apr 25 (2) | P |
| NE 5-18-29 | | Apr 25 (2) | | P |
| SE 6-18-29 | | Apr 25 (1) | Apr 25 (2) | P |
| SE32-18-29 | | | Apr 25 (1) | P |
| NE32-18-29 | | | Apr 25 (1) | P |
| NW35-22-29 | | Apr 25 (1) | | P |
| SE 1-23-29 | | Apr 25 (2) | | P |